THE UNIVERSITY OF ALBERTA

FLEXIBLE EXCHANGE RATES AS A MECHANISM OF INTERNATIONAL ADJUSTMENTS

by

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A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR

THE DEGREE OF MASTER OF ARTS

DEPARTMENT OF ECONOMICS

EDMONTON, ALBERTA

SEPTEMBER, 1966

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UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read and recommended to the Faculty of Graduate Studies for acceptance, a thesis entitled "Flexible Exchange Rates as a Mechanism of International Adjustments," submitted by Dimitri Margariti Sakellariou, in partial fulfilment of the requirements for the degree of Master of Arts.

ABSTRACT

This thesis considers the present standing of the theoretical case for flexible as opposed to fixed rates and the circumstances which make each case relatively stronger or weaker from the standpoint of a single country.

Although the larger part of the thesis is devoted to the examination of theoretical models, empirical data are added not so much with the intention of proving or disproving the case for either system, but rather for the purpose of strengthening a point made for or against either, for supporting a conclusion drawn from a particular argument, or sometimes for pointing out that there is an equally strong reason for adopting one system as for embracing the other.

The criteria chosen to compare the appropriateness of the two systems are mainly those of balance of payments adjustments and of the maintenance of stability of income and employment in a country. We consider the efficiency with which each system achieves balance of payments equilibrium and the strength that each system possesses in maintaining stability of income and employment in this country.

Parallel to that the thesis examines the relative strength that tools such as monetary and fiscal policies have under each system. It also examines the effects of speculative activities on the stability of exchange rates.

The treatments of the various parts of the thesis are briefly outlined in the introductory chapter where the sequence of the chapters is also indicated.

In general this thesis acknowledges the theoretical case for flexible exchange rates and concludes that there are no major economic difficulties to prevent the establishment by countries of exchange rates freely determined in open markets, and the abandonment of direct controls over exchange transactions.

ACKNOWLEDGEMENTS

The completion of this thesis was made possible by a summer grant from the University of Alberta to which I extend my sincerest thanks. Dr. Thomas Powrie who acted as my supervisor gave me invaluable guidance and assistance at every stage of the preparation of this thesis.

To him I owe my first debt of appreciation.

I would also wish to express my thanks and appreciation to Dr. S.E. Drugge for his helpful suggestions and criticism which helped clarify my thoughts in preparing chapter VI.

Finally I am very grateful to Miss Surbeck, who in typing this thesis overcame the almost impossible deadlines that I asked her to meet.

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CHAPTER I

INTRODUCTION

The Western nations seem committed to a system of international payments based on exchange rates between their national currencies fixed by governments and maintained rigid except for occasional changes to new levels. This system is embodied in the statutes of the International Monetary Fund, which provides for changes in exchange rates of less than 10 per cent by individual governments without approval of the Fund and for larger changes only with approval, and it is taken for granted in almost all discussions of international economic policy.

According to Friedman[1] "whatever may have been the merits of this system for another day, it is ill-suited to current economic and political conditions." The fact is that economists today seem to be moving toward agreement that the international monetary arrangements of the free world show inadequate structural soundness. This concern, aggravated by the balance of payments problem of the United States, has reopened for discussion the whole range of possible

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[1]Milton Friedman, Essays in Positive Economics (Chicago: University of Chicago Press, 1953), p. 157.

arrangements for international payments and liquidity. Only recently (July 25 and 26, 1966) the Ministers and Governors of the Group of Ten met in The Hague and considered a report of the O.E.C.D. on possible improvements in the balance of payments adjustment process. Although the Ministers and Governors were in full agreement that there is at present no general shortage of reserves they thought that existing sources of reserves are unlikely to provide an adequate basis for world trade and payments in the longer run. Large U.S. deficits are not a satisfactory source of future reserve increases for the rest of the world nor are they acceptable to the United States.

The Ministers and Governors also discussed a comprehensive report by their Deputies that contained several suggestions for improving the existing international monetary system otherwise than through reserve creation.[2]

In such a setting, it is appropriate to consider the case for flexible exchange rates as a method of dealing with problems of international liquidity and payments equilibrium. Flexible rates are widely felt to offer a solution to problems of both international liquidity and external equilibrium.

There are those people however who believe that the pegging of exchange rates should not be abolished before a

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[2]"Communiqué on International Liquidity," International Financial News Survey, (July 29, 1966), p. 245.

lasting improvement concerning these problems can be expected. Different people have different conceptions of a system of pegged exchange rates. Many conservatives[3] advocate rigidity of exchange rates as part of a general policy of relatively unrestricted free enterprise combined with monetary stability. People favoring government planning, on the other hand, tend to believe that rapid economic development may, or even must, force governments to sacrifice economic stability. Such people tend to be little concerned that the abandonment of the orthodox aims of monetary management is incompatible with a truly pegged exchange rate. As a currency weakens, an exchange rate that had previously been at equilibrium becomes a disequilibrium rate unless all other countries happen to inflate at the same pace. Official acknowledgement of the depreciation of the currency can be put off temporarily but cannot be avoided forever.

Prolonged overvaluation is probably the most undesirable form of exchange-rate "management". Most subtle are the disadvantages of the truly pegged variety of pegged exchange rates which the conservatives advocate. If a system of genuinely pegged exchange rates should be workable

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[3]Friedman, widely considered as a conservative, is not one of those who advoate such rigidity.

without exchange controls, it imposes the highest possible standards on monetary and fiscal policies. This in itself is not necessarily undesirable. Past experience has shown that those governments who - disregarding warnings that a determined policy of disinflation was politically unfeasible - have experimented with the traditional tools of central banking have seen their efforts rewarded. But though monetary policy may be a workable policy, it can be argued that it is severely handicapped if exchange rates remain rigidly fixed.

Among the theoretical arguments that have been used against flexible exchanges[4] is that they may be unworkable when elasticities of import and export demand are low. Chapter II will examine this argument.

Chapter III investigates the effects of capital movements on exchange rates, on the volume of credit, and on the national income.

Many economists tend to believe that speculation must accentuate exchange rate instability when the rates are free to fluctuate. While only practical experience can tell which outcome is more likely in any given situation, the theoretical analysis in chapter IV shows that the presumption that speculation will generally be a stabilizing force is at least equally strong.

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[4]Throughout this thesis the terms "flexible" or "fluctuating" shall refer to an exchange rate whose level at any instant is determined in a free exchange market without exchange controls and without prescribed limits of fluctuation. Official intervention in the market is absent except possibly to limit temporary fluctuations.

Chapter V presents a theoretical treatment of forward exchange markets and demonstrates the point that monetary policy can be handicapped if exchange ratios against other currencies remain rigidly fixed. It also shows that a little help from the monetary authorities can ensure that speculation will be stabilizing.

Chapter VI deals with the impact of foreign trade on the level of employment under the usual assumptions underlying Keynesian analysis. It shows how a system of flexible exchange rates can act as a buffer against the transmission of business cycles from abroad.

Finally in chapter VII, which is the concluding chapter, the case for flexible exchange rates is reviewed in the light of the main argument against it.

It is proposed that the case for it rests upon a second best solution. Given whatever rigidities exist in the domestic economy, a flexible exchange rate would be a matter of indifference if domestic policy instruments were sufficient in quality and quantity to keep the foreign exchange market in balance and also achieve all other publicly defined economic goals. But when the available policy tools are too weak to gain all desired objectives, the argument grows strong for employing a flexible exchange rate to free these instruments from direct concern with the balance of payments.

CHAPTER II

DEMAND AND SUPPLY ELASTICITIES AND THE FOREIGN EXCHANGE MARKET

This chapter will be restricted to a discussion of the current account in the balance of payments. The assumptions made are: (1) There are only two countries. (2) Each country produces only a single commodity for export. The second assumption is necessary since it is not meaningful to associate an elasticity (of demand or supply) with a group of commodities unless prices and quantities of all commodities in the group change in the same proportion. (3) Infinite supply elasticities and so constant domestic prices of each country's export commodity. (This assumption is for the purpose of making a geometric presentation as simple as possible.)[1] The foreign price of a good is then a scalar multiple of the exchange rate.

A subject that is usually overlooked is the exact nature of the commodity demand schedules whose elasticities are supposed to determine the properties

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[1]For the case where supply elasticities are finite see Appendix I of this thesis.

of the foreign exchange market. The usual definition of a "partial" demand curve is that it is a locus indicating the quantities demanded of a product when its price is changed while all other prices are held constant. If aggregate spending on a commodity is an insignificant part of the total volume of transactions and if all cross-elasticities with other goods are small, the partial equilibrium demand curve is a reasonable first approximation to the actual demand curve facing a firm or industry. For the imports of a country, however, as a function of the rate of exchange, the two will probably differ beyond recognition. Only a demand curve drawn up under mutatis mutandis assumptions can be meaningfully used for the comparative static analysis of the exchange market.

At the other extreme from a partial demand curve would be a locus of points showing the quantities of a commodity demanded for different prices while almost all the rest of the economy (for this study, all markets except the foreign exchange market) is in general equilibrium. The value of the "total" elasticity associated with such a demand schedule would depend, in addition to the partial own-elasticity of demand, on the sign and magnitude of all partial cross-elasticities and any income effects that a price change in this particular market might generate. Even a total demand

curve has to presuppose that the total outstanding volume of credit remains within certain bounds. We will derive now the supply and demand schedules in the market for foreign exchange from the underlying demand schedules for imports in the domestic economy and abroad.

Since internal prices of each country's exports are assumed constant, the commodity units may be chosen in such a way that these prices equal unity. This makes the demand curve for foreign exchange identical with the demand curve for imports. Given any demand function for imports, $M = f(r)$, the total amount of domestic currency spent on imports is Mr,[2] the demand for foreign exchange $\frac{Mr}{r} = M = f(r)$ as before. The elasticities of demand for imports and of the demand for foreign exchange will then also be the same.

The supply schedule of foreign exchange can be derived as follows.

In Figure 1a, demand for exports X is plotted as a function of their price $\frac{1}{r}$.

Figure 1b shows the corresponding total revenue curve $\frac{X}{r}$ plotted again as a function of $\frac{1}{r}$.

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[2]The rate of exchange "r" is defined as units of domestic currency per unit of foreign currency.

To obtain total revenue as a function of r, we make use of a rectangular hyperbola which relates $\frac{1}{r}$ to r (Figure 1c). The transformation is such that the ordinate corresponding to every point such as p' in Figure 1d equals the value of the abscissa for the corresponding point P in Figure 1b. This yields the supply function of foreign exchange S(r).

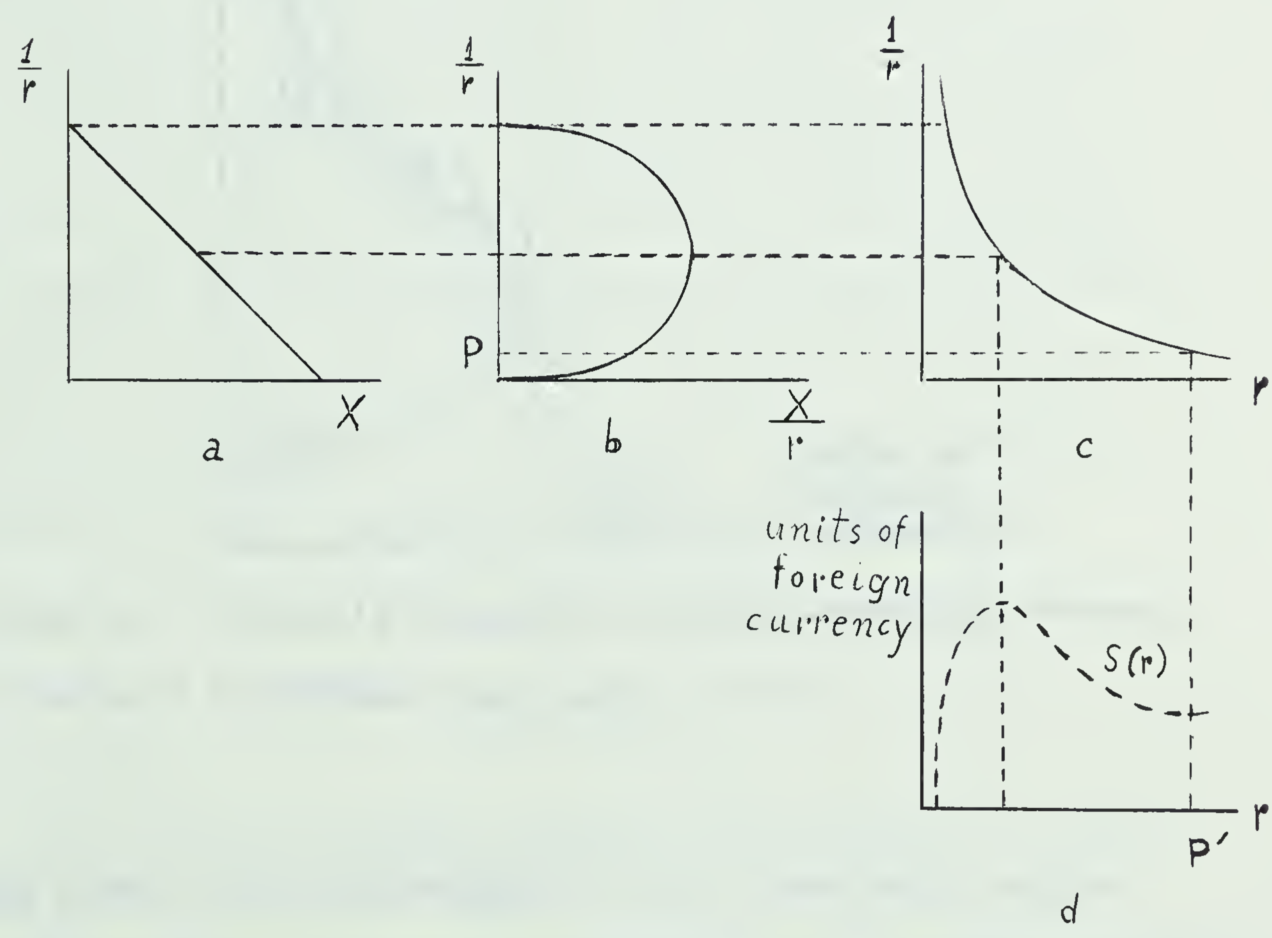

Fig. 1. - Derivation of the supply schedule of foreign exchange, S(r), from the demand function for a country's exports.

Source: E. Sohmen, <u>Flexible Exchange Rates</u> (Chicago: The University of Chicago Press, 1961), p. 4.

It is apparent from Figure 1 that the supply schedule of foreign exchange begins to bend backward at the point where the underlying export demand curve has unitary elasticity. If a sufficiently inelastic demand curve passes through this region as shown in Figure 2 the foreign exchange market will be unstable.

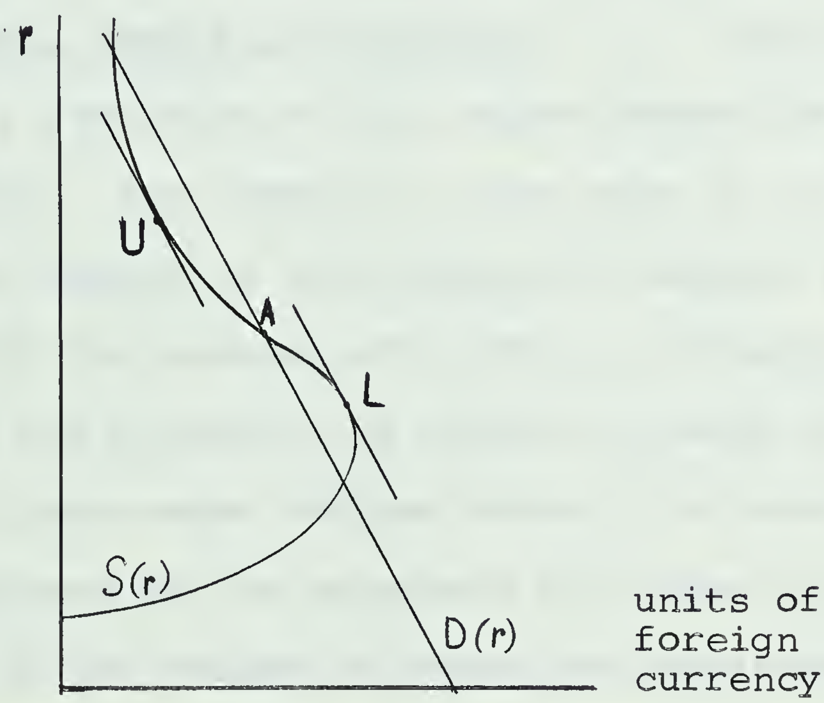

Fig. 2. - Locally unstable foreign-exchange market

Source: E. Sohmen, op. cit., p. 4.

The range from L to U in Figure 2 is an unstable region, since within its boundaries devaluation will either increase the gap in the balance of autonomous payments (between A and U) or reduce a surplus (between L and A).

The possibility that the foreign exchange market may be statically unstable has been a topic for discussion among economists for many years. Postulating infinite supply elasticities, the proposition that the sum of the elasticities of demand for imports in two countries must exceed unity if a (small) depreciation of the currency of either country should improve its balance on current account can be deduced from Appendix J of Marshall's Money, Credit and Commerce.[3] An "improvement" is defined as a reduction of the excess demand for foreign exchange. The theorem is true only if (a) the elasticities of supply of each country's exports are infinite and (b) the balance of trade is initially zero.

Unless the condition is stated in terms of "total" elasticities in the sense defined above, the issue is further complicated by the existence of income effects, i.e., changes in the volume of output and employment caused by the change in the external balance after a movement of the exchange rate.[4] Since we work with

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[3]A. Marshall, Money, Credit and Commerce (London and New York: Macmillan, 1923).

[4]A reference for refinements of the criterion, often called the Marshall- Lerner condition, is Joan Robinson, "The Foreign Exchanges," Essays in the Theory of Employment (London and New York: Macmillan, 1937).

total elasticities, price and income effects need not be considered separately. This approach is only meaningful if the properties of total demand functions can be clearly determined. "Elasticity pessimism" became a school of thought in the formulation of exchange rate policy during the years after World War II. Many economists have opposed devaluation of currencies by countries in balance of payments difficulties on the grounds that demand elasticities might not be high enough to guarantee that the deficit would be eliminated or reduced. P.T. Ellsworth writes:

> When a country faced with a seriously adverse balance of payments is forced off the gold standard, ... what determines the extent to which - given the size of the disturbing factor - its currency will depreciate? Clearly the outcome depends upon the elasticity of its demand for and supply of foreign exchange. Very elastic schedules will hold exchange rate fluctuations within comparatively narrow limits, while inelastic demand and supply of exchange will mean that any balance of payments disturbance can be adjusted (if at all) only by a very large degree of exchange depreciation.[5]

On the other hand S. Laursen and L. Metzler comment:

> The ... more important element in the skepticism produced by the interwar experience was the realization that the demand for exports and imports may not be responsive to changes in currency values. If the demand for imports in most countries were as inelastic as the interwar experience seemed to

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[5]P.T. Ellsworth, "Exchange Rates and Exchange Stability," The Review of Economics and Statistics XXXII (Feb., 1950), p. 12.

> suggest, a system of fluctuating exchange rates would be an inefficient method of correcting a disequilibrium in the balance of payments; large movements of exchange rates would be needed to correct relatively modest deficits or surpluses. Indeed, the response of imports and exports might conceivably be so small that depreciation would augment rather than diminish the size of a country's deficit. In such an event, a system of free-market exchange rates would not be a self-adjusting mechanism; currency depreciation would create a situation leading to further depreciation, and the cumulative, unstable movement might well continue until the monetary system broke down completely.[6]

Whether or not elasticity pessimism of this kind is justified is of importance for the issues discussed in this paper. The case for flexible exchanges would collapse if a situation were possible in which no statically stable exchange rate existed at all. Let us assume that the market exhibits an unstable equilibrium such as the one indicated by A in Figure 2. What elasticity pessimists seem to have in mind is the absence of a stable equilibrium exchange rate anywhere. This would require that, as we move away from A in either direction, the two market schedules never intersect again.

Let us first examine the properties of the schedules as r increases (i.e., as domestic currency

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[6] S. Laursen and L. Metzler, "Flexible Exchange Rates and the Theory of Employment," The Review of Economics and Statistics XXXII (Nov., 1950), p. 282.

depreciates). If the demand schedule were to remain inelastic forever, expenditure on imports in terms of domestic currency would increase infinitely as r approached infinity. With domestic prices assumed constant, the physical quantity of domestic commodities a country is able as well as willing to supply to the rest of the world would eventually have to exceed all bounds. The same follows if supply elasticities are finite as long as domestic prices of exports rise less than in proportion to the depreciation. Since no country has command over infinite resources, the possibility of import demand remaining inelastic is precluded. At worst, unit elasticity must be attained sooner or later. This alone guarantees stable equilibrium at a positive exchange rate after sufficient depreciation irrespective of the shape of the foreign demand for exports. (Exports must not be Giffen goods for which the quantity demanded declines to zero at a positive price when their price is lowered).

Barring the case of Giffen goods the supply schedule of foreign exchange can approach the vertical axis only at infinity. Its approach to the axis means that foreign demand for a country's exports becomes perfectly inelastic. Unlike the limiting case of the demand function for imports, however, this type of behavior of the supply function of foreign exchange is realistic. All it requires is that foreign demand for a country's exports should be satiable as their prices approach zero.

The fact that the demand schedule must become elastic at some point while the supply schedule will become more and more inelastic as the prices of a country's exports approach zero leads to the conclusion that the two schedules must intersect again. Hence a point of new equilibrium exists which is a stable equilibrium.

The general conclusion is then that even though the relevant elasticities may be very low over a certain range, depreciation in the real world will eventually lead to a stable equilibrium at a finite positive exchange rate. Elasticity pessimists, however, note that such a rate might be too high to prove socially and politically bearable. That is, a more depreciated exchange rate is less "favorable" on welfare grounds since though it would improve the balance of payments it would at the same time worsen the terms of trade of the country concerned. Be that as it may. A more decisive argument against elasticity pessimism is the existence of another stable equilibrium point below the unstable range, i.e., at a more "favorable" exchange rate than any one of the unstable rates. That such a rate exists can be demonstrated by the similar reasoning to that used above to deduce the existence of the upper stable equilibrium, bearing in mind that an infinite exchange rate for one currency is equivalent to one of zero for the other (i.e., If $r \rightarrow \infty$ then $\frac{1}{r} \rightarrow 0$). There is a symmetry between the two countries. Writers on the foreign exchange market have usually been exclusively

concerned with the consequences of low elasticities for the deficit country. The Marshall-Lerner condition applies to the surplus country in precisely the same way, however. A small devaluation will not only accentuate the excess demand for foreign exchange by the deficit country if the elasticities are below the critical level; the country with a surplus will find as well that its balance on current account deteriorates when its currency is devalued.[7] If for one country a stable rate will be reached eventually if the depreciation is carried far enough the symmetry of the Marshall-Lerner condition assures that the same must hold for its trading partner. A stable equilibrium above the region of instability from the point of view of one country is equivalent to one below the unstable range for the other country.

Marshall had already pointed out that every unstable range of exchange ratios must be bounded by stable equilibria. This proposition was stated as follows:

> On the extreme hypothesis that each of two imaginary countries, in exclusive trade with one another, had an urgent demand for a small quantity of the other's goods, but could find no good use for any large quantity of them, then there might be several positions, alternatively stable and unstable, of equilibrium between them.

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[7]The statement is true only if the change in the balance of trade is measured in the same currency in both cases. Given an initial imbalance in the current account devaluation may result in an improvement of the balance when measured in one currency, in a deterioration when measured in the other.

If OE and OG [Fig. 3a of this thesis] both belong to this exceptional demand class, they may cut one another three (or any other odd number of) times, not counting 0. The first of these reached from 0 in either direction, will be stable, the second unstable, the third stable and so on....[8]

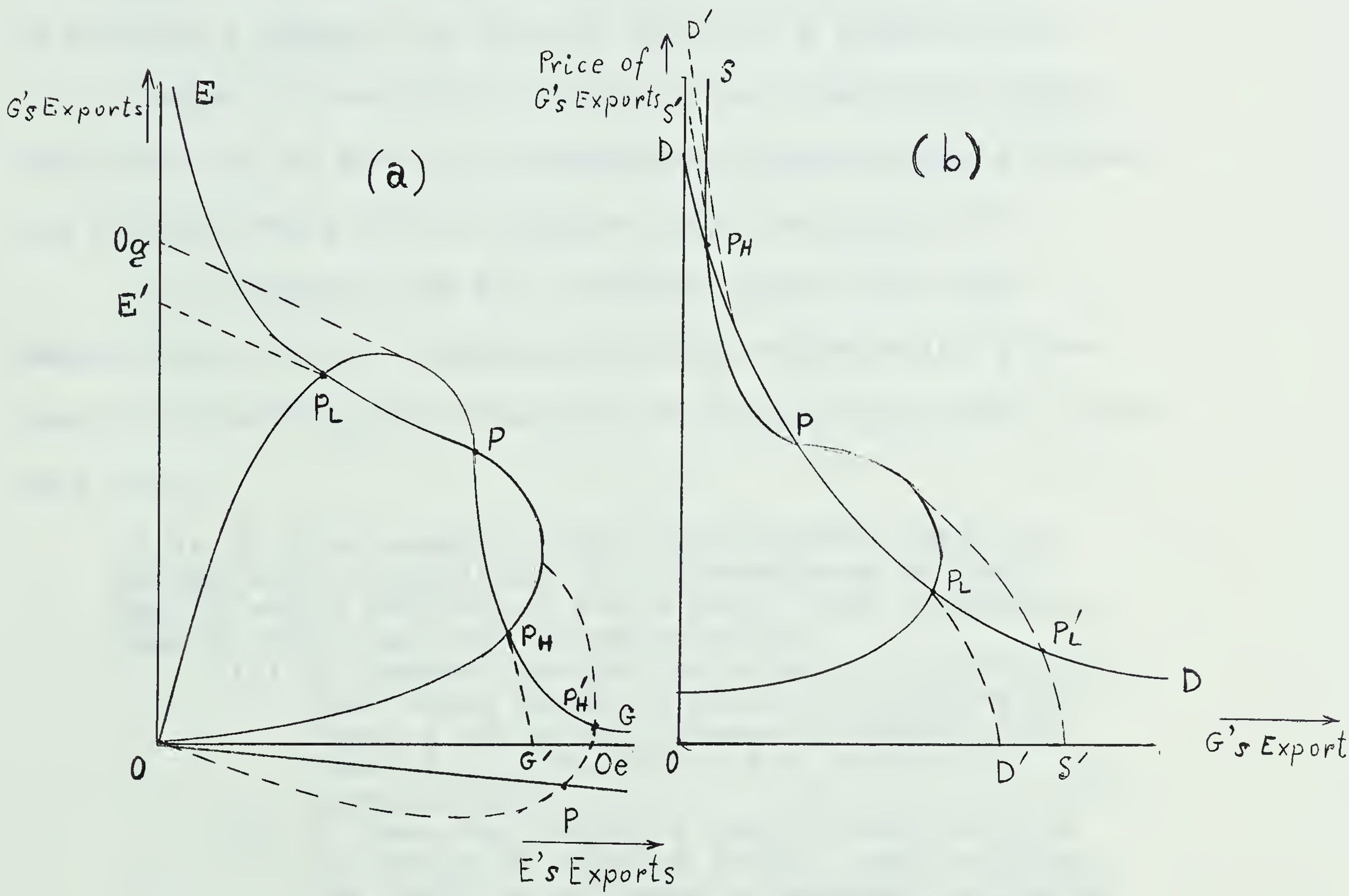

Fig. 3. - Offer curves with unstable equilibrium.

Source: Figures are based on Fig. 20 of Appendix J of A. Marshall, op. cit., p. 352.

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[8] A. Marshall, op. cit., p. 352.

In Figure 3(a), which is based on Figure 20 of Appendix J to Money, Credit and Commerce, OE and OG are the reciprocal demand curves of E and G; in Figure 3(b) these are translated into the more familiar concepts of demand and supply for imports as functions of the price of imports, DD being E's demand for imports and SS G's supply curve. P is a point of unstable equilibrium and there are stable equilibria at P_H and P_L, representing respectively a higher and a lower price of E's imports than the price at P.

J. Bhagwati and H.G. Johnson, using the above Marshallian curves, attempted to disprove Marshall's contention concerning the necessity of stable equilibria. They note that:

> It is at once apparent from the diagrams that the Marshallian proposition is a consequence of the way in which the curves are drawn. Each reciprocal demand curve has two characteristics:
> (i) it passes through the origin, implying that there exists a finite high price of imports which will choke off demand for them; i.e., the demand for imports is terminable;[9]
> (ii) it does not join the import-good axis as the price of imports falls, implying that the quantity of imports demanded increases indefinitely as their price falls; i.e., the demand for imports is unsatiable.
> It is these characteristics which ensures that the reciprocal demand curves (demand and supply curves) intersect at least once above and below the (unstable) equilibrium price. But neither of these characteristics

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[9]"Each country's reciprocal demand curve must cut its export axis somewhere, as the country cannot spend more than its total national income on imports; but intersection at any other point than the origin implies that an infinitely high price is required to end demand."

is a necessary logical consequence of demand theory;[10] on the contrary both are empirical assumptions. Moreover, both characteristics appear inconsistent with Marshall's own assumption that each country has "an urgent demand for a small quantity of the other's goods, but could find no good use for any large quantity of them."

If neither assumption holds good for either country, the demand for imports being interminable but satiable in each country, the unstable equilibrium may be the only equilibrium possible at a finite exchange ratio; this possibility is illustrated by the curves O_eE' and O_gG' in Figure [3(a)], and D'D' and S'S' in Figure [3(b)]. If a country's demand for imports is satiable but not interminable, there may be only one stable equilibrium possible at a finite exchange ratio, this ratio entailing a higher price for the first country's imports than the unstable equilibrium price ratio. This case is illustrated by the combination of OE' O_gG or O_gG' and of OG' with O_eE or O_eE' in Figure [3(a)], to which correspond the combinations of DD' with S'S and S'S' and SS' with D'D or D'D' in Figure [3(b)]. If one country's demand for imports is interminable but not satiable, while the other country's demand for imports is both satiable and interminable, there may again be only one stable equilibrium possible at a finite exchange ratio, this ratio entailing a lower price for the first country's imports than the unstable equilibrium price ratio. This case is illustrated by the combination of O_eE with O_gG' and of O_gG with O_eE' in Figure [3(a)], to which correspond the combinations of D'D with S'S' and S's with D'D' in Figure [3(b)]. But if the demand for imports is both insatiable and terminable in one country, or satiable but terminable or insatiable but interminable in both, there will be a stable equilibrium at both a higher and a lower exchange ratio than the unstable equilibrium price ratio. These cases are illustrated in Figure [3(a)]

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[10] Consider, on the one hand, a bread and water economy or one relying on imports of a raw material not producible at home; on the other hand, the case of inferior goods."

> respectively by the combinations involving OE or OG, the combination of OE' and OG', and the combination of O_eE and O_gG; to these correspond combinations involving DD or SS, the combination of DD' and SS', and the combination of D'D and S'S in Figure [3(b)].

and in a footnote they conclude:

> Our analysis thus demonstrates the fallacy of the assertion made...that an unstable foreign exchange market equilibrium is necessily enclosed by stable equilibrium points.[11]

The two authors do not indicate whether country E's offer curve is supposed to coincide with the axis from O to O_e or whether it extends below the axis (dotted curve in Figure 3(a) of this thesis). In either case, the offer curve intersects the origin at a non-positive angle.

The slope of the ray from the origin to any point P on an offer curve equals the domestic price ratio at which a community demands and supplies the quantities of imports and exports indicated by the location of P with respect to the origin O. An offer curve whose path through the positive quadrant starts at O_e would require that the export commodity of country E be a free good. In other words, that an amount up to OO_e could be produced at zero or negative marginal utility to all residents of E. Therefore, the Johnson - Bhagwate argument that an unstable

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[11] J. Bhagwati and H.G. Johnson, "Notes on Some Controversies in the Theory of International Trade," Economic Journal LXX (March, 1960), pp. 91-93.

equilibrium may not be bounded by stable ones can be reached only by abandoning basic axioms of economic theory.

Now a free market will move away from a point of unstable equilibrium. A freely fluctuating exchange rate will not therefore rest at an unstable level.

Egon Sohmen argues that

> If an economy should ever find itself in the vicinity of an unstable equilibrium point such as A in Figure [2], not only will appreciation of an administered exchange rate eventually create a surplus in its balance of autonomous payments, but a freely fluctuating exchange rate may move downward and thus improve the country's terms of trade. More important the authorities always have the power to push the exchange rate toward its lower rather than its upper stable equilibrium. This can be done by massive sales of foreign exchange, obtained from the reserves of a stabilization fund or through a short-term loan from abroad, until the supply schedule of foreign exchange is pushed far enough to the right to leave only the lower (stable) equilibrium intersection with the demand curve for foreign exchange. Once the exchange rate remains in the neighborhood of the lower equilibrium point, foreign exchange can be gradually repurchased by the central bank. An attractive feature of such an operation is its profitability for the exchange authorities. They sell foreign exchange when its price is high and repurchase it when it is low.[12]

It is often argued that demand elasticities in international trade are substantially higher in the long run than in the short run, owing to the fact that exporters and importers react to movements of the exchange rate only after a certain time lag. The fear was expressed

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[12]Egon Sohmen, <u>Flexible Exchange Rates: Theory and Controversy</u> (Chicago: The University of Chicago Press, 1961), pp. 11-12.

that high long-run elasticities may not be sufficient to guarantee the practical workability of a flexible exchange system, since low elasticities in the short-run might render the foreign exchange markets highly unstable. This view neglects the effects of (a) arbitrage between organized commodity and stock exchanges in different countries, and of (b) speculation in foreign exchange. If long-run elasticities are high enough to guarantee a unique stable equilibrium level for the exchange rate, the operation of profit maximizing arbitrageurs and speculators can be expected to hold the actual market rate at any time close to that level, regardless of short-run instability (assuming freedom of international capital movements).

It is argued that devaluation to the stable equilibrium rate of exchange whether by decree or through automatic adjustment of a fluctuating rate, lowers a country's potential welfare and that it is therefore in a country's interest to keep the exchange rate pegged at the disequilibrium level. This means that a larger import surplus, other things being equal, enables a country temporarily to have command over a larger amount of resources. This neglects the question whether the deficit can be financed at all or the fact that larger current consumption forces a downward adjustment on the disposable social product in future periods, unless the magnitude of free foreign aid can vary in direct proportion to the deficit in the foreign balance.

In the real world countries are usually forced to adjust the size of their trade deficits to the available international loans or gifts rather than the other way around. The refusal to use exchange rate adjustment to keep the deficit down to a permissible level leaves deflationary monetary and fiscal policies or direct controls on imports as the only alternatives. The confinement, however, of the deficit on current account to a prescribed level per unit of time through direct controls is unlikely to permit a higher level of potential welfare than the use of price and exchange rate adjustments.

It is true that exchange controls can increase a country's potential welfare level through exploitation of its monopoly power over the rest of the world.[13] What is overlooked in this argument, however, is (a) that it is an argument for limited controls and that potential welfare will decline once controls reduce trade below a certain level; (b) that it favors limited controls in a situation of entirely unrestricted trade, but not in the real world where a great number of trade restrictions are already in effect and where it is not known whether or not they exceed the "optimum" level; and (c) that no country exports just one single product, but many commodities with different

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[13]This is S. Alexander's case for direct controls in preference to devaluation. "Devaluation versus Import Restrictions as an Instrument for Improving Foreign Balance," International Monetary Fund Staff Papers, I (1950 - 51), pp. 379-96.

demand elasticities. The imposition, therefore, of controls across the board to cope with foreign exchange difficulties is a crude instrument compared with selective tariffs that take the differences between individual demand elasticities into account.

Sohmen pointedly remarks:

> The strength of elasticity pessimism varies considerably with the issue concerned. Many of our British colleagues, for example, have in the years before the recent improvements of the United Kingdom balance of payments repeatedly discounted devaluation of the pound as an effective measure to relieve pressure on sterling. On the other hand, all fears of low elasticities seemed to have been forgotten in the campaign of 1957 to have West Germany appreciate the mark. Sufficient faith in their previous convictions would have compelled them to wonder whether devaluation of the German mark might not be a more appropriate step to reduce the German export surplus.[14]

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[14] E. Sohmen, op. cit., p. 15.

CHAPTER III

CAPITAL MOVEMENTS UNDER A FLEXIBLE EXCHANGE RATES SYSTEM

So far we have considered a foreign exchange market without autonomous capital movements. Supply and demand of foreign exchange were based only on the demand for imports of goods and services in the two countries and the capital account was supposed to respond passively to imbalances in the current account. But let us relax now this restriction.

There are four ways of financing an imbalance in the current account:

(a) Private gifts and intergovernmental assistance in the form of loans or unilateral grants.

(b) Changes in the official reserves of gold and foreign exchange held by the central bank or a stabilization agency.

(c) Gold movements undertaken by private transaction.

(d) Private capital movements.

Of these four types of operation the analysis of the last two will provide an understanding of the guiding principles of a compensatory official financing.

The effects of capital movements on the foreign-exchange market are familiar. An autonomous inflow of funds, for example, increases the supply of foreign exchange in the same way as if exports of goods and services had increased by the same amount. Under a flexible exchange rate system, an inflow must lead to appreciation, an outflow to depreciation of domestic currency. We have in mind here movements of "funds" rather than movements of "capital", since capital movements can cause changes in exchange rates only to the extent that they induce shifts in the market schedules for foreign exchange (currency and bank deposits). The acquisition of foreign bonds against a three months' draft rather than cash, for example, leaves the exchange rate temporarily unaffected.

The monetary effects of private capital movements depend on the policies adopted. If exchange rates are pegged, the monetary consequences of international transactions are the same as they would be under the gold standard. That is, the central bank's commitment to purchase and sell foreign exchange at specified rates of exchange causes changes in bank deposits identical to those that would be caused by purchases and sales of gold. Bank reserves are created or destroyed by the same amount.

The mechanism of adjustment to capital movements under "pegged" exchange rates is the same as that under the gold standard only if the central bank's margin is roughly the

same as the spread between the gold points.[1] Capital movements under pegged exchange rates may lead to purchases and sales of foreign exchange by the central bank only when the exchange rate is driven to one of the boundaries of the margin in the same way as capital movements under the old gold standard could lead to gold flows only when the exchange rate was driven to one of the gold points. As long as an exchange rate moves somewhere between the boundary values at which the central bank starts its pegging operations, it is in effect a freely fluctuating one. The monetary effects are then those typical of fluctuating rates, that is, they are absent except for transitory disturbances. The wider the spread between the exchange rate pegs, the more closely does the system approach fluctuating rates. A widening of exchange rate pegs alone is, of course, illusory if a currency remains permanently at one of the boundaries of fluctuation as a result of the country's economic policies. The central bank may, furthermore, not confine its intervention on the exchange markets to times when the rate reaches its boundaries. Any purchase and sale of foreign exchange by the central bank causes the monetary effects described above, even though the exchange rate may fluctuate between the officially established pegs.

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[1]The rates at which central banks buy and sell foreign exchange usually differ by a small margin which may be smaller or larger than the average spread that existed between the gold points.

Theoretically it is possible to assume a "pure" system of pegged rates in which there is no spread at all between the central bank's buying and selling rates for foreign exchange.

Central banks have the power to counteract changes in reserves caused by international transactions by discretionary measures elsewhere. Sterilization of capital movements is very likely if exchange rate stabilization is undertaken through an independent stabilization fund, for example. This fund may finance the acquisition of foreign exchange by issuing debentures of its own.[2] No expansion of the money supply can take place under these circumstances when the fund purchases foreign exchange.

Under a system of flexible exchange rates the effects of capital movements are altogether different. If the central bank does not intervene in the foreign exchange market, an autonomous inflow of funds, for example, will not lead to an increase in the legal reserves of commercial banks. Theoretically it is possible, in the absence of legal reserve requirements, that such an inflow will encourage private banks to expand the volume of deposits as they acquire additional holdings of foreign exchange. In view, however, of the reluctance of bankers, when exchange rates fluctuate freely, to take a position in

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[2]F. Machlup, "The Theory of Foreign Exchanges," Economica N.S., VI (1939 - 40); reprinted in AEA Readings in the Theory of International Trade (Philadelphia: Blakiston, 1950), pp. 137-44.

foreign exchange beyond the minimum balances required for the financing of regular trade, such acquisition will generally remain temporary. In this case it can be assumed that an autonomous inflow of funds will be available to importers.[3] The price of foreign currency must fall sufficiently to induce importers to absorb the additional supply of foreign exchange through increased purchases abroad. The exchange rate will perform here the part of the needed adjustment that other more sluggish variables such as prices or real income are unable to effect.

In principle, changes in internal prices could produce the same effects on trade as changes in the exchange rate. For example, a decline of ten per cent in every internal price in Germany (including wages, rents, *et cetera*) with an unchanged dollar price of the mark would have identically the same effects on the relative costs of domestic and foreign goods, as a decline of ten per cent in the dollar price of the mark, with all internal prices unchanged.

Professor M. Friedman notes that:

> If internal prices were as flexible as exchange rates, it would make little economic difference whether adjustments were brought about by changes in exchange rates or by equvalent changes in internal prices. But this condition is clearly not fulfilled. The exchange rate is potentially flexible

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[3] It is of course possible that part of the additional supply of foreign exchange may be temporarily absorbed by speculators. Such an absorption means complete sterilization.

> in absence of administrative action to freeze it. At least in the modern world, internal prices are highly inflexible...Wage rates tend to be among the less flexible prices. In consequence, an incipient deficit that is countered by a policy of permitting or forcing prices to decline is likely to produce unemployment rather than, or in addition to, wage decreases. The consequent decline in real income reduces the domestic demand for foreign goods and thus the demand for foreign currency with which to purchase these goods. In this way, if offsets the incipient deficit. But this is clearly a highly inefficient method of adjusting to external changes. If the external changes are deep-seated and persistent, the unemployment produces steady downward pressure on prices and wages, and the adjustment will not have been completed until the deflation has run its sorry course.[4]

Primary reliance on changes in internal prices and incomes was tolerable in the 19th Century partly because the key countries of the western world placed much heavier emphasis on freedom from government interference at home and unrestricted multilateral trade abroad than on domestic stability; thus they were willing to allow domestic economic policy to be dominated by the requirements of fixed exchange rates and free convertibility of currencies. This emphasis gave holders of balances confidence in the maintenance of the system and so made them willing to let small differences in interest rates determine the currency in which they held their balances. Furthermore, the emphasis on freedom from government interference at home gave less scope to internal monetary management and so meant that most changes affecting

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[4]M. Friedman, Essays in Positive Economics (Chicago: The University of Chicago Press, 1953), p. 165.

international trade reflected real changes in underlying conditions. Modern conditions, with the widespread emphasis on full employment at home and the extensive intervention of government into economic affairs, are different and much less favorable to this method of adjustment.

To the part of the adjustment said to be performed by the exchange rate there is, however, one important qualification. Although total elasticities must be large enough to guarantee stable long-run equilibrium in the neighborhood of an exchange rate actually realized in a free exchange market, it is not to be expected that the reactions of regular exports and imports are fast enough to respond immediately to sudden bursts of capital flows. In the short run, it can safely be assumed that regular export and import demand and supply are relatively inelastic. However there are buffers available which contribute toward high elasticity of demand and supply of foreign exchange in the very short run. A significant one, for example, at least for the currencies of the large trading nations, is arbitrage between the leading commodity and stock exchanges in the countries concerned. In equilibrium, the quotations on organized exchanges for the same items, compared on the basis of the ruling exchange rate structure at any moment, must be identical except for brokerage and transport costs. As soon as an exchange rate is disturbed, opportunities for profitable arbitrage arise, since the market quotations for staple commodities and shares of

corporations that are traded on the stock exchanges of several countries will be out of line. Although this factor may succeed in bridging the random disturbances that arise in the foreign-exchange market from day to day, the volume of transactions of this type is not important enough to smooth out larger disturbances, such as those due to seasonal factors or to the transfer of a large international loan. This task will have to be performed by other means of adjustment. In Chapter IV it will be shown that foreign exchange speculation is one of these means of adjustment if general economic policy provides a suitable climate.

E. Sohmen believes that continuous stabilization of exchange rates by central banks or government bodies is a doubtful substitute for profit-oriented, private short-term capital movements. He writes:

> The endorsement of flexible exchange rates should not be misunderstood to imply a summary condemnnation of stabilizing central bank intervention in the exchange markets. I am convinced, however, that intelligent guidance of private currency speculation and interest arbitrage by public policy...is, barring exceptional circumstances, both sufficient and preferable for safeguarding adequate stability of exchange rates.[5]

He also thinks that complete freedom of capital movements is a necessary condition for the success of a system of freely fluctuating exchange rates. If capital movements are subjected to exchange controls, then he argues:

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[5]E. Sohmen, Flexible Exchange Rates Theory and Controversy (Chicago: The University of Chicago Press, 1961), pp. 11-12.

> Neither the bridging of short-run disparities through international arbitrage between organized exchanges, nor speculation proper is possible.

On the other hand other authors are the opinion that flexible exchange rates would not be feasible unless tight controls are imposed on capital movements and all speculative transactions are made impossible.

S. Laursen and L. Metzler, for example, state that:

> It seems highly probable, from the interwar experience, that a regime of flexible exchange rates would not be successful unless capital movements were subject to some type of control.[6]

As to the role of speculative capital movements the same authors note that:

> Exchange rates during that decade (The Thirties) underwent frequent and substantial fluctuation and although the exchange rates at the time were by no means free-market rates, the fluctuations that occured nevertheless created serious doubts concerning the effectiveness of a flexible exchange system in equilizing a country's international payments and receipts. The doubts arose, in the first place, because the upward and downward movement of exchange rates was considerably aggravated by speculative capital movements.

We shall discuss in Chapter IV more extensively the role of private speculation and interest arbitrage and how they can be used toward the realization of countercyclical objectives. Now we will turn our attention to the effect of autonomous capital movements on a country's national product when levels of effective demand in both countries are initially given.

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[6]S. Laursen and L. Metzler, "Flexible Exchange Rates and the Theory of Employment," The Review of Economics and Statistics, XXXII (November, 1950), pp. 282-83.

Two different kinds of repercussions of capital movements on the level of output can be observed. The first is an "indirect" one that occurs due to changes in the volume of credit that may be induced by international capital transfers. The second is the "direct" change in the national income that occurs whenever a capital movement entails a change in the current account of a country's balance of payments. As we have seen, only the first type of adjustment occurs under the gold standard and pegged exchange rates. Whatever amount of a capital inflow is absorbed by the central bank is not available for the purpose of financing a change in the country's current account. A speculative capital inflow will in the "pure" case of pegged exchange rates immediately boost the central bank's reserves of foreign exchange (or gold) and can only bring about whatever expansionary effect on the country's output an expansion of credit is capable of performing.

Under a system of freely fluctuating rates the income effects of capital movements are the exact opposite. Assuming that a speculative inflow of funds is not absorbed as an increase in the foreign exchange portfolios of banks or of counterspeculators, it must eventually be purchased by commercial traders and will induce additional imports of the same value. A capital inflow is therefore directly deflationary under fluctuating exchange rates while it is indirectly

inflationary in the "pure" case of a system of pegged exchange rates.[7]

There is also a significant difference between the income effects of an imbalance in the current account under pegged and under fluctuating rates. Under Keynesian under-employment equilibrium domestic prices are stable. Stability of exchange rates also means that the prices of all imports remain unchanged over time. Where exchange rates are flexible, on the other hand, a capital inflow will not only result in a rise in the value of imports, but also in a reduction of their domestic prices owing to the simultaneous exchange rate adjustment. In real terms, the increase in imports is consequently larger than suggested by the increase in their value. The change has also an influence on domestic prices. The prices of identical goods of domestic origin will have to fall in the same proportion. For it is to be expected that there will usually be high enough and predominantly positive cross-elasticities of demand between imports and domestically produced goods so that pressure is exerted on most domestic prices.

But which repercussions are to be preferred? Those under pegged or the ones under fluctuating exchange rates?

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[7]This was recognized in G. Haberler, Prosperity and Depression (Cambridge, Mass.: Harvard University Press, 4th ed., 1958), pp. 446-48.

Long-term capital movements generally respond to real factors and are under normal circumstances relatively independent of expectations concerning short-run movements of exchange rates. Also under normal circumstances, countries in which real factors (in particular the marginal productivity of capital) tend to favor long term capital exports are relatively more likely to suffer from stagnation than countries where real factors favor capital imports. An increased export surplus brought about directly by an outflow of capital under fluctuating exchange rates can therefore be more easily afforded by these countries, as can the cyclical brake of an import surplus by the recipient countries.

By comparison, the desirable real adjustments in response to an autonomous long-term capital inflow can be generated only in a round-about way under the system of pegged exchanges. To create an export surplus in the country exporting long-term capital, a deflation of credit is brought about and tends to lower effective demand further. The opposite cyclical symptoms will be occuring in the receiving country.

Under universal full-employment conditions things are different. A capital export will, under flexible exchange rates, cause neither a contraction of the money supply in the exporting country nor an expansion in the importing country. A real transfer still occurs initially, since there are assumed to be no takers but commercial traders for

the new supply of foreign exchange in the recipient country, but it has come through a depletion of inventories. Unless counteracted by tighter monetary policies, this will eventually lead to price increases in the capital-exporting country. The monetary effects that occur when exchange rates are pegged, on the other hand, tend to work in the right direction.

Looking now at the short-term capital transfers we see that they are mainly guided by speculative expectations of exchange-rate movements. Short-term funds will flow into countries whose currencies are expected to appreciate. If all countries pursue policies designed to preserve long-run stability of exchange rates, short-term capital will move to countries where currencies have temporarily depreciated. These will, however, also be the countries where deflationary policies are needed more than elsewhere and where the import surplus generated by a short-term capital inflow is therefore most desirable.

If, on the other hand, a country's policies do not promote long run stability of exchange rates and the price level, the income effects of speculative capital movements under freely fluctuating rates are likely to become self-inflammatory. If depreciation of a currency is under way and is expected to continue, speculative capital will move away. This capital outflow tends to induce additional exports which aggravate the inflationary trend.

In the "pure" case of truly pegged exchange rates (that is, where buying and selling rates coincide) nobody is

supposed to have any incentive to undertake speculative capital movements. With a spread between buying and selling rates, the adjustment processes are the same as under fluctuating rates as long as the rate fluctuates within these limits. When the rate bounces against one of the boundary values, there are two possibilities of speculative behavior. One is that speculators believe that the authorities will succeed in maintaining the given peg, in which case the effect of profit-maximizing speculation on the exchange rate will be stabilizing. It will not, however, have any repercussions on effective demand or the money supply that would speed up the expected adjustment. Rather, while direct income effects are again absent, the induced monetary effects go in the opposite direction.

The other possibility is that speculators, distrusting the power of the authorities to preserve the given peg, undertake destabilizing speculation. Direct income effects are again absent since all foreign exchange demanded by speculators will be offered by the central bank when the currency has depreciated to the upper exchange-rate peg. The induced monetary effects, however, go in a direction that accelerates the return to the previous equilibrium.

From the above discussion we see then that speculative capital movements by themselves stabilize best and directly under fluctuating exchange rates when speculators

expect long-term stability, while they tend to stabilize, though in a rather indirect manner, under pegged exchange rates when speculators that the peg cannot be preserved. Given the present unwillingness of most central banks to submit their policies to the dictate of international transactions, too much cannot be expected from induced changes in the money supply alone.

On the other hand, the direct income effects of autonomous capital movements are distinct. It then appears that a system of freely fluctuating rates, combined with measures designed to establish confidence in their stability over the long run, is an optimal combination.

CHAPTER IV

CAUSES AND EFFECTS OF SPECULATION IN FOREIGN EXCHANGE

We shall begin by making a few simplified assumptions some of which will be retained throughout of this chapter, while others will be later relaxed. For example, we shall retain the assumption that individual speculators attempt to maximize profits. An assumption that has to be examined more carefully, however, is that of speculators having correct foresight of the future path of the exchange rate. This is not a perfectly valid postulate. Speculators can, at best, be expected to have approximately correct foresight. The assumption is made, however, because, like any other hypothesis it is necessary for unambiguous conclusions. On the other hand, the examination of speculators' behavior under perfect foresight will help us appreciate the advantages of governmental policies that ensure a high degree of predictability.

We shall first discuss the simplest possible case in which interest rates in two countries are the same (so that speculators are, as far as interest earnings are concerned, indifferent as to where they keep their funds) and in which the exchange rate follows a sinusoidal path of

constant amplitude, phase, and period over time in the absence of speculation (such as the oscillation shown in Figure 4). Suppose there exists one single speculator, and that he is important enough to exercise an influence on the exchange rate and has command over a sufficient supply of funds to undertake the activities described below.

With a given pattern of supply and demand for foreign exchange from non-speculative sources, the exchange rate r (r = unit price of foreign currency) is a function of time and the intensity of speculative supply of foreign exchange to the market at every instant of time, s(t)'. (Negative values of s(t) indicate speculative purchases.):

$r = r(t,s)$, where, for stability, $\frac{\partial r}{\partial s} < 0$ (1) that is, increased supply of foreign exchange by the monopolistic speculator causes a fall in its price.

If we assume that the speculator's operations are costless, his net revenue during a small time interval will be $r(t,s) \cdot s(t)\,dt$ (2) and over a whole cycle it is $\int_0^{\frac{2\pi}{w}} r(t,s) \cdot s(t)\,dt$ (3) where w is a parameter. Net revenue equals profits if the speculator's foreign-exchange position at the end of the cycle is the same as that at the beginning of the cycle, that is, if $\int_0^{\frac{2\pi}{w}} s(t)\,dt = 0$ (4). Only if this condition is fulfilled it is possible to evaluate speculators' profits.

If $s(t) = 0$ over the whole length of the cycle, that is, if the speculator does not intervene in the market

at all, his net revenue is zero. It will also be zero when the speculator's supply function s(t) is such that the exchange rate is at all times equal to R, that average level of the fluctuation.

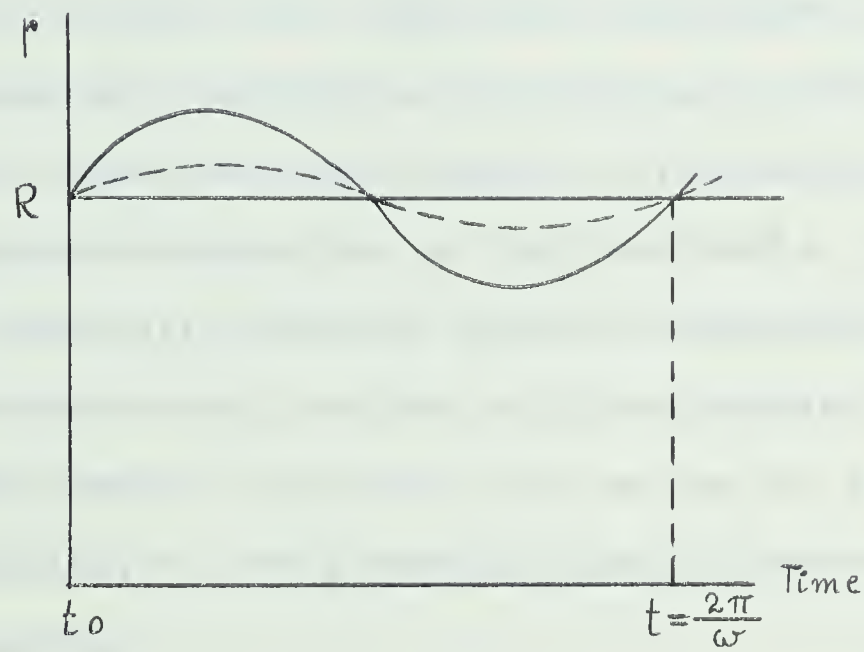

Fig. 4. - Time paths of the exchange rate without speculation (solid curve) and with profit-maximizing speculation under accurate foresight (dashed curve).

Source: E. Sohmen, op. cit., p. 48.

Since his sales of foreign exchange depress its price and his purchases raise it, this result follows when he purchases relatively large amounts during one half of the cycle and sells them during the other half. He can make positive profits by selling and buying only moderate quantities. One of the theorems of the mean guarantees that there is at least one intermediate path between maximum fluctation and perfect stability that yields maximum profits for the

speculator.[1]

Mathematically, the task is to find the function $\hat{s}(t)$ that makes the integral in (3) a maximum, subject to the constraint (4). Having found the maximizing function $\hat{s}(t)$ (provided the function $r(t,s)$ was known), the time path that results when the monopolistic speculator maximizes profits could be obtained by substitution into $r(t,s)$. But the function $r(t,s)$ cannot be known exactly. The calculation of $\hat{s}(t)$ is therefore impossible in the real world. But the effect of maximizing behavior when the speculator's foresight is approximately correct is clear enough: it will reduce the amplitude of fluctuation and so act in a stabilizing manner according to any acceptable definition of stabilizing behavior.

What happens when speculation is perfectly competitive? Application of the classical model would suggest that, if none of the speculators has a perceptible influence on the price of foreign exchange and entry is free, their attempt at profit-maximization will tend to wipe out all profits. Assuming that speculators' operations are costless and given our sinusoidal oscillation we can conclude that perfect competition among speculators with free entry should eliminate all fluctuation entirely and result in a constant exchange rate equal to R. For if even a small residual of the

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[1] R.G.D. Allen, Mathematical Analysis for Economists (London: Macmillan, 1938), p. 452.

original cyclic time path remained, some scope for positive profits of newly entering speculators would exist, contrary to the condition for long-run equilibrium in a perfectly competitive industry.

In the real world, the operations of speculators are not costless. Free entry will eliminate profits while some oscillation still remains. The same is true if entry is not entirely free, possibly because the required volume of freely moveable funds is not available or because governments refuse to permit speculative capital movements. Uncertainty is another reason why oscillations will never be entirely eliminated.

No definite conclusion is possible if speculators' foresight is substantially less than perfect. Governments can contribute to such a state of affairs by confused and erratic policies.

Assuming, however, that speculators' operations were costless and foresight perfect, the exchange rate would not deviate from its long-run equilibrium value as long as this value does not change itself.

The underlined qualification suggests that we should have in mind that perfect stability does not imply constancy of the nominal rate of exchange between currencies. If it did, any tendency of speculation to move the rate at all might be called destabilizing. But speculation that causes pressure on the actual rate of exchange - which is held at some

arbitrary value by the intervention of a stabilization agency or by straightforward government decree - should actually be called stabilizing and not destabilizing. On the other hand, any force that tends to hold the current price at the old level at a time when a trend toward a permanent increase in the future equilibrium price is already clearly apparent is destabilizing. This is because it prevents a movement to the new equilibrium level, which is the one that matters, and keeps the level to the old. People may continue to see the latter as the equilibrium level because they have become accustomed to it.

Among modern writers, Milton Friedman has identified himself with the view that speculation must be stabilizing if it is to be profitable for speculators as a group:

> People who argue that speculation is generally destabilizing seldom realize that this is largely equivalent to saying that speculators lose money, since speculation can be destabilizing in general only if speculators on the average sell when the currency is low in price and buy when it is high.[5]

He is cautious enough to add, however:

> It does not of course, follow that speculation is not destabilizing; professional speculators might on the average make money while a changing body of amateurs regularly lost larger sums. But, while this may happen, it is hard to see why there is any presumption that it will; the presumption is rather the opposite.[6]

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[5] M. Friedman, op. cit., p. 175.

[6] Ibid., p. 175.

And in a footnote he continues:

> A warning is perhaps in order that this is a simplified generalization of a complex problem. A full analysis encounters difficulties in separating "speculative" from other transactions, defining precisely and satisfactorily "destabilizing speculation," and taking account of the effects of the mere existence of a system of flexible rates as contrasted with the effects of actual speculative transactions under such a system.

Similar views have been voiced by A.P. Lerner[7] and F.A. Lutz.[8] In his major work on international trade, J.E. Meade leans toward the belief that speculation will usually be stabilizing.[9]

Probably the earliest precise statement of the position that destabilizing speculation must be unprofitable for the body of speculators as a whole is due to John Stuart Mill:

> For it often happens that speculative purchases are made in the expectation of some increase of demand, or deficiency of supply, which after all does not occur, or not to the extent which the speculator expected. In that case the speculation, instead of moderating fluctuations, has caused a fluctuation of price which otherwise would not have happened, or aggravated one which would. But in that case the speculation is a losing one, to the speculators collectively, however much some individuals may gain by it ... The operations, therefore, of speculative dealers, are useful to

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[7]A.P. Lerner, The Economics of Control (New York: Macmillan, 1944), p. 70.

[8]F.A. Lutz, "The Case for Flexible Exchange Rates," Banca Nazionale del Lavoro Quarterly Review, VII (December, 1954), p. 184.

[9]J.E. Meade, The Balance of Payments: Mathematical Supplement (London: Oxford University Press, 1951), Chapter XVIII.

> the public whenever profitable to themselves; and though they are sometimes injurious to the public, by heightening the fluctuations which their more usual office is to alleviate, yet whenever this happens the speculators are the greatest losers.[10]

W.J. Baumol[11] has attempted to provide specific examples to show that this is not universally true. Baumolian speculators are what might be called "piggy-back operators"; they take a rise in the price as an indication that it will rise still farther, and their speculative purchases at such a time produce exactly this result. They reverse themselves before the price path in the absence of all speculation would have reached its peak and so initiate a cumulative downward movement. If the non-speculative market is characterized by a sinusoidal price path, Baumol's speculators again produce a sinusoidal cycle, but one of shorter duration, and hence with increased frequency of oscillation. The amplitude of fluctuation may be larger than that in the absence of speculation while the piggy-back operators may nevertheless, as a body, earn "positive profits". Baumol shows that, in addition, their activities may cause an explosion of an otherwise damped price oscillation.

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[10]J.S. Mill, Principles of Political Economy, Ed. Sir W.S. Asley (1909) (London: Longmans, Green & Co., 1939), Book IV, Chapter II.

[11]W.J. Baumol, "Speculation, Profitability and Stability," Review of Economicsand Statistics, XXXIX (August, 1958), pp. 263-71.

This does not affect the conclusions reached so far, however. Whereas positive "profits" may not be a sufficient condition for "piggy-back speculation" to be stabilizing, profit-maximization is. E. Sohmen notes that "Whereas the solution of the variational problem of maximizing an integral" such as (3) in this chapter, "will in general only yield one profit-maximizing function s(t), and one that will with certainty lower the amplitude of fluctuation, there is an infinity of other functions s(t) that also guarantee positive, though lower, profits. Among them, there may well be modes of behavior, of which Baumol presents a few special examples, that have destabilizing effects according to certain criteria of stability."[12]

Another important subgroup of functions s(t) yielding non-negative profits for the whole body of speculators is the one provided by perfectly competitive speculation with perfect foresight under varying degrees of freedom of entry. All of them act in a stabilizing way as we have seen. Baumol's speculators cannot possibly be maximizing profits and at the same time have accurate foresight. In his examples, the market is left with trendless sinusoidal fluctuations, an excellent opportunity for a supplementary field of "super" speculators who, in their turn, would flatten out the oscillations which the activities of the previous,

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[12]E. Sohmen, <u>op. cit.</u>, p. 56.

non-profit-maximizing operators have left over. In Hicks's language, Baumol's models are characterized by high elasticity of expectations.[13] The possibility of destabilizing movements arises primarily from the assumption that changes in current prices may exercise a strong influence on people's price expectations. Another objection to Baumol's analysis is that part of the speculative profits in his model is illusory, since accumulation of inventories over a cycle is not precluded, as it should be. (A book profit on accumulated inventories due to a price rise over the cycle may be wholly spurious since the price might fall back to the original level or even below it if the accumulated inventories were liquidated.) Furthermore, even the supposedly "non-speculative" group in Baumol's models reacts to changes in prices as well as to the actual price level. Such behavior is essentially speculative. His "speculative" group can therefore legitimately be said to include only part of all speculators, a fact that precludes an unambiguous

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[13]Hicks's "elasticity of expectation" of the price of commodity "x" is defined as "the ratio of the proportional rise in expected future prices of "x" to the proportional rise in its current price." Zero elasticity implies that current price changes in no way affect a person's expectations concerning future prices. If the elasticity is unity, "a change in current prices will change expected prices in the same direction and in the same proportion." J.R. Hicks, Value and Capital (2d ed.; London: Oxford University Press, 1946), Chapters XX-XXII.

appraisal of the influence of speculation as such on the basis of his models.[14]

The presumption of high elasticity of expectations is less justified the more nearly correct speculators' expectations are. If they foresaw future price movements with perfect accuracy, only the level of current and expected future price would influence their actions, and not their rate of change. On the other hand, dependence of expectations on the current rate of change of an exchange rate is increasingly likely the more uncertain its future path. Some continuity and predictability of exchange-rate movements is therefore a prerequisite if speculation is to perform its economic function. Among the objections raised against a theory of speculation based on the assumptions in this chapter, is the contention that the interaction of speculators' expectations is likely to generate its own momentum and may lead to violent disturbances of the time path of an exchange rate even when foresight concerning the behavior of non-speculators is highly accurate. Here only empirical evidence can tell whether the actual behavior of exchange speculators contradicts the conclusions suggested by a model that neglects interaction of speculative expectations. Nurkse's League of Nations study seem to support this claim.

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[14] L.G. Tesler, "A Theory of Speculation Relating Profitability and Stability," with "Reply" by W.J. Baumol, Review of Economics and Statistics XLI (1959).

Nurkse notes that:

> After the unpegging of the franc - dollar exchange in March 1919 the external value of the franc was determined from day to day by the free play of supply and demand in a market operating without any support or intervention by the Bank of France or Treasury. .....In the first two or three years after the cessation of hostilities the depreciation of the franc was due primarily to the current account deficit arising from the abnormal post-war import requirements. With the fall in raw-material prices on the world market, the franc recovered during 1921. Depreciation set in again in 1922; and this time it was due increasingly to capital exports prompted by speculative anticipations of a continued fall in the exchange.
>
> Such anticipations are apt to bring about their own realization. Anticipatory purchases of foreign exchange value of the national currency, and the actual fall may set up or strengthen expectations of a further fall. The dangers of such cumulative and self-aggravating movements under a regime of freely fluctuating exchanges are clearly demonstrated by French experience of 1922-26. Exchange rates in such circumstances are bound to become highly unstable, and the influence of psychological factors may at times be overwhelming.[15]

Speculators were a more active element in the market for French francs from 1924 to 1926. Whether their activities were "destabilizing" then is doubtful. According to S.C. Tsiang,[16] the French experience does not lend itself to this interpretation, as the folklore of economics would

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[15]League of Nations (Ragnar Nurkse), International Currency Experience (New York: Columbia University Press, 1944), Chapter V.

[16]S.C. Tsiang, "Fluctuating Exchange Rates in Countries with Relatively Stable Economies": "Some European Experiences After World War I," International Monetary Fund Staff Papers VII (1959), pp. 244-73.

have us believe. As Tsiang points out, no other outcome but perennial inflation would possibly be expected from the French policy during these years of having the central bank peg interest rates and supply the public with any desired amount of credit at these rates.

The view that speculators' activities are not "destabilizing" is supported further by the Canadian experiment with flexible exchange rates after the Second World War. The amplitude of oscillation of the Canadian dollar since 1950 can be considered minimal in spite of its exposure to speculative forces and the almost complete withdrawal of the Canadian authorities from the exchange markets. The maximum amplitude of fluctuation of the Canadian dollar since 1952 has been below 5 per cent. The behavior of speculators in Canadian dollars has been analyzed by R.R. Rhomberg.[17] He concludes that the available evidence lends strong support to the hypothesis that that speculators have, on the whole, acted in a stabilizing manner. Rhomberg examines a model of Canada's foreign exchange market taking his starting point from the proposition that the foreign exchange rate during a particular quarter is determined by the demand for and the supply of foreign exchange. He divides the transactions which give rise to such demand and supply into four classes:

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[17]R.R. Rhomberg, "Fluctuating Exchange Rates in Canada: Short-Term Capital Movements and Domestic Stability," (Ph.D. Dissertation, Yale University, 1959). Summarized in "Canada's Foreign Exchange Market," International Monetary Fund Staff Papers VII (1960), pp. 439-56.

(1) exports and imports of goods and services, (2) long-term capital movements, (3) purchases or sales of gold or foreign exchange by the central bank, or by some other official agency, in the course of intervention in the exchange market, and (4) short-term capital movements.

The model specifies equations designed to explain the magnitudes of Canada's exports and imports of goods and services and of the net long-term capital inflow into Canada. But the main purpose of the model is to examine the relation between the exchange rate and the net balance of short-term capital movements.

Since the balance of payments in the accounting sense always balances, the short-term capital balance is equal to the negative value of the sum of the current account balance, the long-term capital balance, and the change in official reserves. This identity is a part of the model, but the short-term capital balance also measures the extent to which speculative positions in foreign exchange are taken. By "speculative position" is meant a holding or a claim which gives rise to an uncovered foreign exchange risk. The term thus includes both active and passive speculation.

To illustrate the point, let us assume that the net balance of Canada's current and long-term capital account and the change in official reserves leaves a deficit to be settled by a corresponding short-term capital inflow into Canada. The settlement may be partly in cash and partly in commercial credit. To the extent that the exchange risk on

Canadian dollars, or on claims to Canadian dollars, required by non-residents is not covered in the forward market, these positions are speculative in the broad meaning of the term. To the extent that the exchange risk is covered in the forward market, the supply of forward Canadian dollars will exceed that portion of the demand for forward Canadian dollars which has its origin in commercial transactions. The attempt to find forward cover for these net positions would be frustrated and the spot and forward rates would continue to depreciate indefinitely were it not for the fact that at some lower exchange rate speculators will be willing to take uncovered positions in spot or forward Canadian dollars.

If the speculators' demand for, and supply of, foreign exchange were perfectly exchange-rate elastic, the rate would never change. On the other hand, if nobody were willing to speculate, the rate fluctuations would have to be large enough to make the current account balance equal to the long-term capital balance plus changes in official reserves during every quarter, month or week. In order to evaluate the degree of responsiveness of speculative short-term capital movements to changes in the exchange rate, a speculative excess demand function for Canadian dollars must be specified and tested. The hypothesis to be tested is that <u>speculative excess demand for Canadian dollars during a particular quarter is inversely related to the change in the average quarterly exchange rate from the preceding quarter to the quarter in question</u>.

In summary the essentials of the model as presented

by Rhomberg follows:

> "Canadian imports and exports of goods and services are functions of the exchange rate and of other variables. The long-term capital balance does not depend on the exchange rate. When the sum of the current account balance, the long-term capital balance, and the change in official reserves shows a deficit for a particular quarter, the Canadian dollar will tend to depreciate during that quarter. The depreciation must be sufficient to induce an increase in Canadian dollar holdings abroad or a reduction of private foreign exchange holdings in Canada, or both, equal to the deficit remaining at the lower exchange rate. When there is a Canadian surplus, the rate will tend to appreciate sufficiently to induce an increase in foreign exchange holdings in Canada or a reduction of Canadian dollar holdings abroad, or both, equal to the surplus remaining at the higher exchange rate. The depreciation or appreciation of the Canadian dollar from the preceding quarter is, therefore, expected to depend on the size of the deficity or surplus. This relation is modified by the varying size of the differential between Canadian and foreign short-term interest rates and by the value of a variable indicating the state exchange rate expectations."[18]

Details covering the structure of the model and the estimates are given in Appendix C. Equation 9 defines Canada's surplus or deficit on current and long-term capital account plus the change in official reserves. The equilibrium exchange rate is determined by the equality of this balance with the speculative net demand for (or, if negative, the supply of) Canadian dollars (Equation 8)). Equation 1, therefore, determines the change in the exchange rate from the preceding quarter which is necessary to bring about the equality of Equation 8.

Turning to the speculative excess demand function that mainly concern us here, we note that the signs of the coefficients

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[18]*Ibid.*, p. 444.

are as expected on the basis of the underlying hypothesis. Other things equal, a reduction of the exchange rate by 1 cent will stimulate a speculative demand for Canadian dollars of $24 million during the quarter in which the depreciation occurs. In the least-squares estimate, the amount is somewhat larger.

Equation 5 shows the substantial extent of foreign financing of private investment and particularly of provincial borrowing. Also of interest is the large apparent influence of the long-term interest differential.

One of the conclusions that can be drawn from the model is that stabilizing exchange speculation appears to have a larger influence in keeping the fluctuations of the Canadian dollar within relatively narrow limits than either official intervention in the exchange market or the price effect of exchange variations on imports and exports. A depreciation of the Canadian dollar by 1 cent was found to induce a short-term capital inflow into Canada of about $24 million during a quarter. On the other hand official intervention in the market usually involved only small dollar amounts relative to the size of the balances to be settled. The price elasticity of real import demand was found to be around unity, so that the Canadian dollar value of imports would be unaffected by a change in the exchange rate. On the export demand side, the results are inconclusive, the price coefficient having the wrong sign; but it is unlikely that the true short-run elasticity of demand for exports is very large. It seems therefore, that short-term capital has been the principal stabilizer of the Canadian exchange

Rhomberg concludes that "The model confirms the view that in an otherwise stable economic environment unrestricted capital movements need not be feared as a source of unstability. In fact, a workable fluctuating exchange system with a minimum of official intervention must rely on stabilizing capital movements and could not exist without them. The Canadian experience of the 1950's shows that, as long as the trust in continued domestic monetary stability induces stabilizing exchange rate expectations, substantial swings in the balance of payments can be settled by private short-term capital movements, with reasonably small exchange fluctuations. Professor T.L. Powrie[19] is also of the same opinion:

> Subject to the weakness of the data, the short-term capital movements related to (Pn-Pn-1)[20] were the source of the stability of the free Canadian dollar.

and he adds

> To the extent that the relationship of short-term capital movements to (Pn-Pn-1) reflected speculation on the exchange rate, it indicated ..... stabilizing speculation, and implied that the free market could cope by itself with disturbance without excessive fluctuation in the rate of exchange.

The view that speculation will probably be stabilizing has been presented here as the most plausible hypothesis, but by no means as an inevitable necessity.

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[19]T.L. Powrie "Short-Term Capital Movements and the Flexible Canadian Exchange Rate 1953 - 1961," Canadian Journal Of Economics and Political Science XXX (1964), pp. 76-94.

[20](Pn-Pn-1) is the change in the average exchange rate from period (in quarters) n-1 to period n.

Exchange-rate flexibility provides economic policy with an additional degree of freedom but does not deprive policymakers of traditional tools. Should, for example, speculative activities prove to be destabilizing, the authorities are free to use traditional tools to correct excesses.

The following chapter will show how exchange rates can be stabilized through intervention of these authorities in the forward markets.

CHAPTER V

FORWARD EXCHANGE MARKETS

A forward contract calls for delivery on a specified future date at a price agreed upon in advance. An organized forward market in currencies may develop where a fairly large number of traders regularly conclude contracts for future delivery of foreign exchange. The main purpose of such a market is the creation of a hedging facility for commercial traders. An exporter, for example, may expect a future payment in foreign currency whose exact value in domestic currency is unforeseeable under a system of fluctuating exchange rates. If he is unwilling to carry the risk of exchange fluctuations, he may relieve himself of this uncertainty by a forward sale of his expected foreign exchange proceeds at a price known in advance.

One of the important features of the forward exchange market is the relationship between the forward discount or premium for a foreign currency and the short-term interest rates at home and abroad.

Let us consider a two-country model with the following variables.

r_o = spot rate of exchange at time 0.

r_t = forward rate of exchange for delivery at time t. (t = a fraction of a year)

i_d, i_f = domestic and foreign short-term rates of interest.

ε = ad valorem charges for currency conversion, expressed as a percentage of the amount exchanged.

δ = forward premium on foreign currency, expressed as per cent per annum on the basis of the spot rate of exchange.

A holder of idle funds may leave his money at home, in which case one unit of domestic currency will, with a domestic interest rate i_d, grow to

$$D = e^{i_d t} \qquad (1)$$

at time t (e is the basis of the natural logarithms). Or he may transfer his funds abroad (provided capital movements between countries are unrestricted). The existence of a forward market makes it possible to take advantage of a higher foreign interest rate without incurring an exchange risk. The expected holdings of foreign exchange at time t can be sold at the known forward rate simultaneously with the original transfer.

The eventual proceeds of covered interest arbitrage can be calculated as follows: at time t = 0, the conversion of one unit of domestic currency will, with ad valorem conversion changes ε per cent, yield $\frac{(1-\varepsilon)}{r_o}$ units of foreign exchange. At time t, this will grow to

$$\frac{1-\varepsilon}{r_o}\, e^{i_f t} \qquad (2)$$ (Compounded at the foreign short-term interest rate i_f).

If this amount of foreign exchange has been sold forward at time $t = 0$ at the forward rate r_t prevailing then, and if the movement of funds again involves transfer charges of ε per cent, the amount

$$F = \frac{r_t\ (1-\varepsilon)^2}{r_o}\ e^{i_f t} \qquad (3)$$

of domestic currency will be realized eventually. If

$$F \leqq D, \qquad (4)$$

all holders of idle funds in domestic currency have every reason to keep them at home. If on the other hand

$$F > D, \qquad (5)$$

they can make riskless profits by transferring their funds abroad and simultaneously selling the eventual foreign proceeds forward. These transactions will tend to boost the spot and lower the forward rate; they will continue until condition (4) is restored.

Substituting F and D in (4) with their equal we get

$$\frac{r_t}{r_o}\ (1-\varepsilon)^2 e^{i_f t} \leqq e^{i_d t} \qquad (6)$$

Applying the same reasoning to holders of foreign currency balances at time $t = 0$, we derive the second equilibrium condition.

$$\frac{r_t}{r_o}\ (1-\varepsilon)^2 e^{i_d t} \leqq e^{i_f t} \qquad (7)$$

The combination of the two conditions gives us the boundaries for the relative divergence between spot and forward rates

of exchange:

$$(1-\varepsilon)^2 e^{(i_d-i_f)t} \leqq \frac{r_t}{r_o} \leqq \frac{e^{(i_d-i_f)t}}{(1-\varepsilon)^2} \qquad (8)$$

The forward rate for a foreign currency can be expressed as its premium or discount on the spot rate, normalized as a percentage per annum of that spot rate.

that is, $\frac{r_t}{r_o} = 1+t\delta$ (9)

where t is, the life span of forward contracts. Substituting this in (8), taking logarithms of the inequalities and subtracting $t(i_d-i_f)$ from the result, we get

$$2 \log (1-\varepsilon) = \log (1+t\delta) - t(i_d-i_f) \leqq - 2 \log (1-\varepsilon). \qquad (10)$$

Hence, $\left| \log (1+t) - t(i_d-i_f) \right| \leqq 2\left|\log (1-\varepsilon)\right|$, (11)

or, to a first-order approximation.[1]

$$\left|\delta - (i_d-i_f)\right| \leqq \frac{2\left|\log (1-\varepsilon)\right|}{t} \qquad (12)$$

Assuming that transfer costs are zero, the inequality (12) reduces to the single equilibrium equation

$$\delta = i_d-i_f \qquad (13)$$

Equation (13) expresses the fact that the premium or discount (per annum) tends to equal the interest differential, the currency of the country with the lower interest rate being the one that exhibits a forward premium. If short-term interest rates in both countries are identical, spot and forward

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[1]Obtained by expanding log $(1+t\delta)$ is its Taylor series and retaining only the linear term. R.F.D. Allen, Mathematical Analysis for Economists (London: Macmillan, 1938), p. 456.

rates of exchange are forced into equality. The fulfilment of (13) requires not only the absence of all transfer charges but also perfect competition among interest arbitrageurs. Profit maximization by a monopoly arbitrageur would, even when transfer is costless, leave one of the inequalities

$$\int < i_d - i_f \quad \text{or} \quad \int > i_d - i_f$$

derived by reversing one or the other of the inequalities (6) or (7). It can be either one of the two. It is clear that the profits of a monopoly arbitrageur depend on the existence of an absolute difference, regardless of the sign of that difference.

When there are transfer costs ($\mathcal{E} > 0$), we see from (12) that, with a given interest differential, the forward premium or discount has some leeway to vary between certain limits. In addition, the length of the time period over which the forward contract extends becomes a factor determining the limits of variability. The link between sport and forward rates becomes weaker the shorter is the term of the forward contracts. On the other hand, the link provided by speculation will then be all the stronger.

The difficulty of private capital transfer in the presence of exchange controls can be interpreted as an increase in $\mathcal{E}$. Relation (12) gives an indication of the progressive spreading of the limits of variability between spot and forward rates as the costs of transfer increase.

Experience has shown that even at times when no artificial barriers to capital movements existed and both

forward and spot rates were fluctuating freely, covered interest arbitrage has frequently failed to occur on a large enough scale to narrow the gap between forward premium and interest differential to the level indicated by transfer costs. The only explanation for this is absence of sufficient volume of liquid funds for the purpose of covered interest arbitrage.

Of the factors that may limit the intervention of a sufficient volume of liquid funds in interest arbitrage is 1) mere ignorance or 2) the public though fully aware of the profits to be made by arbitrage, does not dispose of enough liquid funds for this purpose. But under normal circumstances, one would expect that there should at least be no acute shortage of funds whose holders are able to take advantage of riskless interest differentials and willing to do so if the opportunity is pointed out to them. This, however, indicates that the supply of arbitrage funds will not be infinitely elastic in practice, as postulated for the purpose of purely theoretical treatment in this chapter. Under the classical gold standard, changes in a country's bank rate were seen as an important supplementary tool for safeguarding exchange stability. If a currency was under pressure, a gold outflow could presumably be prevented by raising the bank rate. The higher returns on short-term investments would attract funds from abroad. As a result, spot demand for home currency could ideally be boosted sufficiently to equilibrate the balance of payments within the gold points without the necessity of large-scale gold

movements.

The imitation of this practice for paper currencies after World War I showed that the leverage of small changes in the bank rate had become considerably weaker. Keynes first expressed the view that the principal effect of changes in the interest rate under fluctuating exchanges was most likely on the forward rate rather than on the spot rate. We have shown above that interest arbitrage will tend to make the spread between spot and forward rates equal to the interest differential between the two countries. But a widening of the spread after a change in bank rate in one of the countries may come about by a movement either of the spot or the forward rate, or both. Without additional information on the shape of the market schedules for both spot and forward exchange, nothing can be said about the relative effect on either.

The forward rate bears the entire burden of adjustment when the market schedules for spot exchange are not affected by a change in the interest differential. This is possible only if the schedules of demand and supply of forward exchange (other than interest arbitrage) coincide everywhere. The attempt to undertake covered interest arbitrage must then fail to result in any actual forward transactions. The mere attempt to sell or buy nevertheless moves the forward rate far enough to produce the required spread in accordance with the given interest

differential. Failure to realize any new forward transactions makes covered interest arbitrage impossible. So no pressure is exercised on the spot rate from this direction.

The question is, therefore, whether excess supply of forward exchange can ever be expected to be perfectly inelastic. Some writers believe that this is always true in the absence of willingness to speculate. An effect of changes in the discount rate on the spot rate of exchange, it is held, can occur only to the extent that uncovered interest arbitrage takes place. But this view overlooks the activities of those commercial traders who regularly cover in the forward market. These traders will take the level of the forward, not of the spot, rate as their strategic variable as Figure 5 shows. S_o and D_o are spot supply and demand of foreign exchange from commercial sources; S_t and D_t indicate supply and demand of forward exchange from the same sources, both functions of the forward rate r_t.

Let us assume that speculation is entirely absent. If, to give a hypothetical illustration of coincidence of market schedules, both forward schedules were perfectly inelastic at the same quantity abscissa, the underlying commodity demand for imports would have to be perfectly inelastic and the demand for exports unit-elastic. Such a curious coincidence is ruled out for all practical purposes. For stability in a free forward market, the schedules must

have the usual shape in the neighborhood of the equilibrium rate, as in Figure 5.

Assuming that, initially, there is no interest differential then the spot and forward rates are identical.[2] A rise of the domestic bank rate will induce an increase in spot supply of foreign exchange S_o and a simultaneous rise in forward demand D_t until the spread between spot and forward rate, $d = \bar{r}_t - \bar{r}_o$ reaches the level required by the given interest differential.

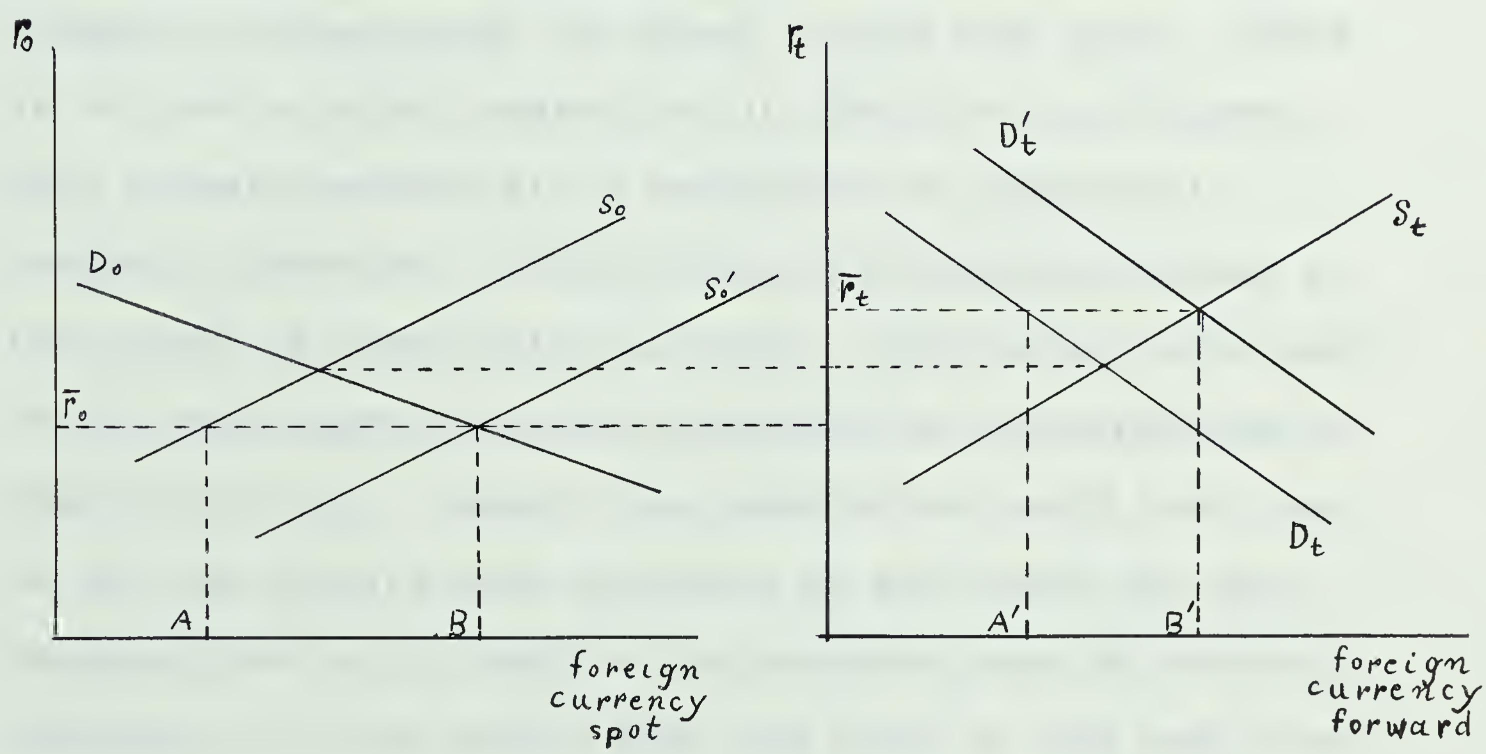

Fig. 5. - Equilibrium in the spot and forward markets of foreign exchange with interest arbitrage. Spot sales by arbitrageurs (AB) equal their forward purchases (A'B').

Source: E. Sohmen, <u>op. cit.</u>, p. 74.

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[2]The assumption here is of perfectly elastic supply of arbitrage funds.

As long as the forward schedules display at least some elasticity, positive amounts of foreign exchange, AB and A' B', will be traded in the two markets. AB and A' B' are equal except for the interest accrual during the period when the funds are held in domestic banks. Both spot and forward rates have to adjust in this case, even though speculation is assumed absent.

The impact on the spot rate may be insignificant if the forward market is very thin compared to the spot market. A large price change may then occur in the former in response to a demand or supply shift small enough to cause almost no effect on the spot rate. There is no good a priori reason why it should be so, however. Thin forward markets are a reflection of commercial traders' ignorance. In that case, the decisive factor is the extent of speculative activity. Speculation will again be the more useful the more accurate the anticipations of speculators are. Competitive speculation would then tend to set the forward rate precisely at the level the spot exchange rate will reach at the maturity date of forward contracts. To the extent that the level of the spot rate in the future is unaffected by the rate of interest prevailing in previous periods, the impact of changes in the discount rate would then tend to fall entirely on the spot rate of exchange.

Even in the absence of speculation, the forward market should be no less active than the spot market, if commercial traders are sophisticated enough. Traders who negotiate contracts stipulating payment in foreign currency in three months' time will, unless they deliberately want to assume exchange risks, deal exclusively in the forward market. To the extent that this group of traders avoids speculative positions in foreign exchange, the shapes of the forward market schedules will be largely determined by the elasticities of current demand and supply of the commodities in which it trades.

The classical gold standard is an example of a system with a very small margin of error of speculators' foresight. For both the spot and forward rates, the gold points (G_x and G_m' in Figure 6) provide definite limits of variability. Once the forward rate reaches the gold export point, speculative short sales of foreign exchange will tend to make the supply of forward exchange perfectly elastic ($\overline{S}_t$), for speculators are assured that they will be able to cover themselves at this rate or less when their contracts mature. It is obvious in this case that it is not actual gold flows, but rather stabilizing speculation that brings about perfect elasticity at the gold points of the forward-market schedules.

Under such a system the spot rate must be very sensitive to small discount-rate changes. But spot rate movements hit against a rigid barrier once the forward premium or discount called for by the existing interest differential reaches the maximum spread permitted by the gold points. If the forward rate stands at the gold export point G_x that is, interest arbitrage cannot drive the spot rate below the gold import point G_m.

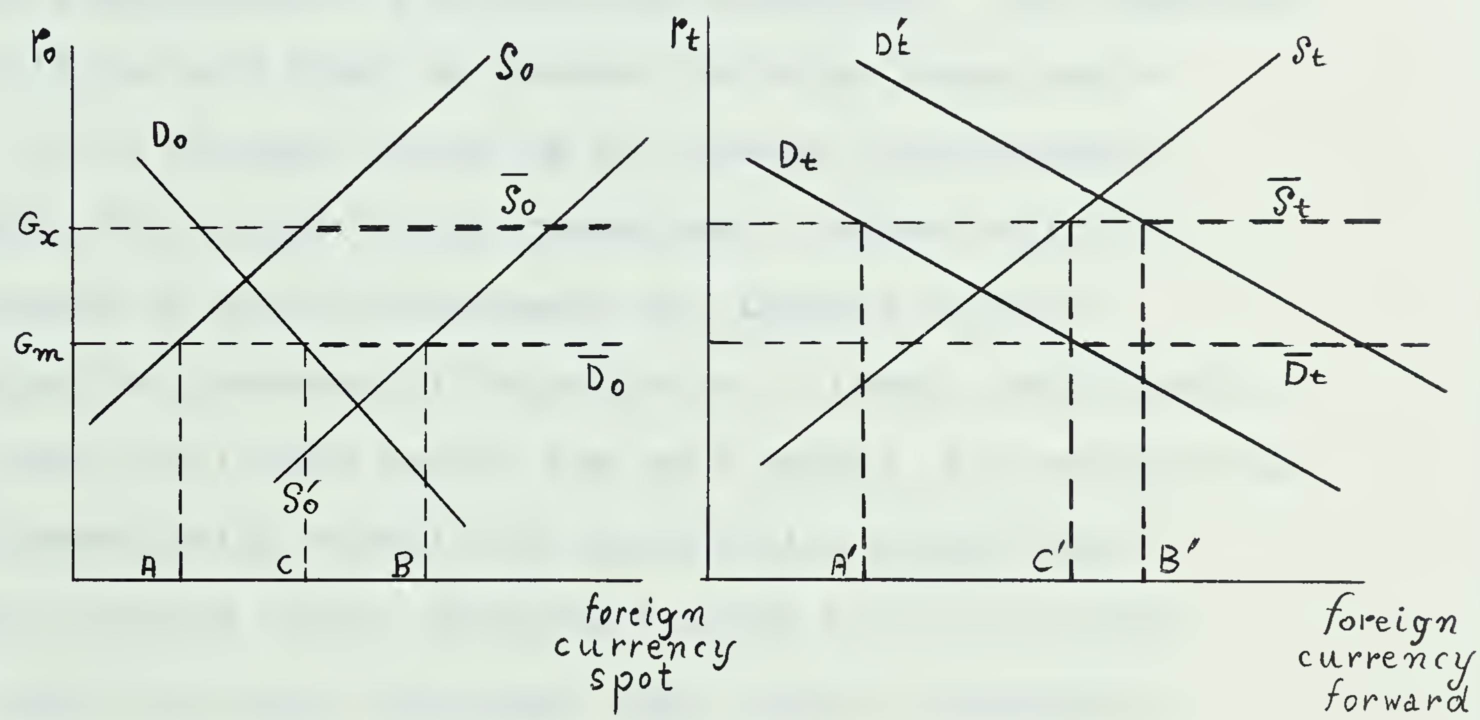

Fig. 6. - Equilibrium in the spot and forward market of foreign exchange under the gold standard. Spot sales by interest arbitrageurs (AB) are absorbed in part by commercial traders (AC), in part by importers of gold (CB). Purchases of forward exchange by interest arbitrageurs (A'B') are partly supplied by commercial traders (A'C'), partly by forward "speculators" (C'B').

Source: E. Sohmen, op. cit., p. 77.

What if monetary authorities insist on keeping the interest rate differential at a slightly higher level than the maximum spread indicated by the gold points?

Three different groups of arbitrageurs are able to reap riskless profits in this case.

a) Let us say that interest arbitrage produces the new schedules S_o' and D_t' of spot supply and forward demand for foreign exchange. Arbitrageurs will then sell an amount AB of spot and buy A'B'of forward exchange (AB = A'B')

b) With commercial traders' market schedules D_o, S_o, D_t, S_t the amount A'C' of the forward purchases of interest arbitrageurs is provided by exporters. The remainder, C'B', will be sold short by foreign exchange speculators.

c) Of the spot sales AB by interest arbitrageurs, the amount AC is absorbed by commercial traders while CB is purchased by gold arbitrageurs for imports of gold.
By keeping the interest differential at a level just slightly higher than the limits set by the gold points, the authorities could theoretically sustain the gold inflow indefinitely.
The gold standard itself provides a check to this process.
Unless gold flows are sterilzed, they cause an expansion of credit at home and a contraction abroad. Domestic interest rates, except for the central bank discount rate which remains fixed by assumption, will decline. The rise in interest rates abroad as a result of monetary contraction there will reduce the interest differential, and foreign incomes and prices will tend to fall as a result of the monetary adjustment. Excess demand for spot foreign exchange from commercial sources will increase and reduce the gold inflow somewhat.

This is an example of the rigidities imposed by the gold standard. Although the balance of payments is very sensitive to changes in the rate of interest, such sensitivity may not be the major objective of monetary policy. If, for example, the main purpose were a reduction of domestic income and prices, a deflationary monetary policy would become self-defeating. An attempt to raise interest rates beyond the limit imposed by the gold points will run at cross-purposes with the expansionary effect of the gold inflow induced by the increase in the domestic discount rate itself. Conversely if the monetary authority wants to combat a depression by easing credit, a fall in short-term interest rates is bound to be ineffectual owing to the compensating effects of the gold outflow produced by interest arbitrage. A determined anti-depression policy in a single country must create the impression that the fall in the value of its currency to the gold export point is not merely a temporary matter. Speculation, therefore, cannot be expected to step in to prevent the gold outflow. Considerations of this nature led Keynes to argue in favor of a wider spread between the gold points.[3]

The disadvantages of the gold standard shown here apply to any system that prevents a movement of exchange

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[3]J.M. Keynes, Monetary Reform (New York: Harcourt, Brace, 1924), pp. 189-91.

rates beyond narrow limits unless the mechanism of international trade and capital movements is prevented from operating by exchange controls. A system of flexible exchange rates on the other hand, makes monetary policy very effective in influencing the level of employment and income.

Interest arbitrage after a sufficient rise in domestic interest rates induces an inflow of funds (AB in Figure 6), depressing the spot rate of exchange r_o. This has further effects. If D_o and S_o in Figure 6 are, as assumed, the spot market schedules for foreign exchange derived from the import demand functions at home and abroad, AB not only indicates the amount of capital inflow, but at the same time the value (in foreign currency) of an addition to that part of the supply of domestically available commodities that is usually imported against spot foreign exchange. This will induce a fall in prices, or reduce inflationary pressure where it existed, without requiring any adjustment of aggregate domestic production.

Conversely, if the interest differential, $i_d - i_f$, becomes negative after an easing of credit by the central bank, interest arbitrage produces a capital outflow associated with an export surplus of those commodities that are usually exported against spot exchange. Whenever a temporary lapse from full employment occurs, an easing of credit by the monetary authority will, in addition to any possible effects on purely domestic spending, bring this stimulus into play.

This mechanism was undoubtedly at work even under the gold standard. Within the gold points, the exchange rate was free to vary and the foreign-trade leverage of monetary policy was operative, although its force was arbitrarily limited by the rigid restraints imposed by the gold points.

The use of a country's foreign accounts as a tool of adjustment should usually be much less painful than the traditional mechanism through which monetary policy is supposed to work. Insufficient price flexibility makes it inevitable that the burden of any domestic adjustment has to be borne by real variables to a large extent. Suppressing an inflationary trend while holding the external balance constant can therefore be expected to involve some reduction in employment, at least temporarily. If, on the other hand, the policies outlined above are used to check inflation, the country's currency appreciates and domestic producers are exposed to an inflow of foreign commodities at reduced prices. Since it is usually the case that part of a country's pattern of production consists of import-competing goods, business in these lines have no other choice but to conform by lowering their prices to the same level. Although it is possible that some initial unemployment occurs in this case as well, its quantitative importance should be significantly less, owing to the assumption of part of the burden of adjustment by enforced price flexibility.

CHAPTER VI

FLEXIBLE EXCHANGE RATES, INCOME, EMPLOYMENT AND GROWTH

Changes in an economy's foreign-trade sector do have repercussions on the level of real national income and employment which in turn pose adjustment problems.

One of the reasons that a country may be reluctant to use changes in internal price levels and employment to meet external changes in the promotion of internal monetary stability, that is, the avoidance of either inflation or deflation. But under a system of fixed exchange rates and unrestricted trade, no country can attain this objective unless every other important country with which it is linked directly or indirectly by trade does so as well. If one country inflates, for example, this tends to increase its imports and reduce its exports. Other countries now start to accumulate currency balances of the inflating country. They must either be willing to accumulate such balances indefinitely, which means they must be willing to continue shipping out goods without a return flow and thus in effect subsidize the inflating country, or they must follow the inflation themselves.

Under this system then, business cycles are propagated throughout the participating countries. A system of flexible exchange rates acts as a buffer to such disturbances.

If, under such a system, any one country inflates, the primary effect is a depreciation in its exchange rate. This offsets the effect of internal inflation on its international trade position and weakens or eliminates the tendency for the inflation to be transmitted to its neighbors. The converse is true of domestic deflation.

Laursen and Metzler[1] have argued, however, that flexible exchanges cannot serve as a perfect buffer to such disturbances even if it is assumed that no capital transfers are permitted, so that the current account is forced into balance at every instant of time and the effect of a non-zero balance of trade on the national income is precluded.

Laursen and Metzler concentrate on the impact on aggregate demand of changes in the price level induced by movements of a flexible exchange rate. They reach the conclusion that flexible exchanges will bring about the opposite effect on output from the one experienced under pegged exchange rates: a boom in one country causes a contraction in the rest of the world.

Their reasoning proceeds along the following lines.

Appreciation of a country's currency, caused by a boom in the rest of the world and subsequent increase in demand for the country's exports, will, *ceteris paribus*,

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[1]S. Laursen and L.A. Metzler, "Flexible Exchange Rates and the Theory of Employment," *Review of Economics and Statistics* XXXII (1950), 281-99.

lower the domestic prices of imports.[2] How does this affect the national income?

The absence of money illusion among consumers implies that real consumption $\frac{C}{p}$ is a function of real income $\frac{Y}{p}$,

where: C = money expenditure on consumption

Y = money national income

p = index of the price level.

Let money expenditure on consumer goods be expressed as a function of money income and the price level.

$$C = f(Y,p) \qquad (1)$$

Absence of money illusion requires that money consumption C be homogeneous of the first degree in money income and price, i.e.,

$$\lambda C = f(\lambda Y, \lambda p) \qquad (2)$$

for any positive constant λ. Equation (2) expresses the condition that a doubling of all prices and money income will double money expenditure on consumption.

Euler's theorem[3] on homogeneous functions then holds.

$$C = \frac{\partial C}{\partial Y} Y + \frac{\partial C}{\partial p} p \qquad (3)$$

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[2]Changes in existing tarrifs or other trade restrictions are ruled out. Otherwise, nothing definite can be said about the price changes that can be expected. Also the assumption is made of constancy of money prices of domestic output.

[3]For Euler's theorem see Appendix B of this thesis.

Transposing terms

$$\frac{\partial C}{\partial p} = \frac{Y(\frac{C}{Y} - \frac{\partial C}{\partial Y})}{p} \qquad (4)$$

for which follows

$$\frac{\partial C}{\partial p} > 0 \; (5) \text{ provided that } \frac{C}{Y} > \frac{\partial C}{\partial Y} \qquad (6)$$

Condition (6) is assured by the fact that average propensity to consume is greater than the marginal propensity to consume. (We are here concerned with short-run effects and therefore neglect qualifications of the type of Duesenberry, Modigliani, or Friedman.) A fall in the price level will therefore lead to a decrease of expenditure on consumption (condition (5)).

This sequence of events results in a change of real consumption in the opposite direction. To see this we require the sign of

$$\frac{\partial (\frac{C}{p})}{\partial p} = \frac{p\frac{\partial C}{\partial p} - C}{\partial p^2} \qquad (7)$$

Substituting for $\frac{\partial C}{\partial p}$ from (4), we get

$$\frac{\partial (\frac{C}{p})}{\partial p} = - \frac{Y}{p^2} \frac{\partial C}{\partial Y} < 0 \qquad (8)$$

which shows that the sign is negative.

This could also be expressed by saying that the demand for consumer goods is price inelastic. In the absence of counteracting forces from the foreign-trade sector, the rise in (real) effective demand caused by a fall of import prices

would boost the country's real national product. We have then reached the conclusion that a foreign boom will, in the first instance, tend to cause a domestic expansion under flexible exchanges and in the absence of capital movements, as it would with pegged exchange rates.

But there are counteracting forces.

In the Keynesian framework, money, wages and prices are assumed constant as long as there is unemployment and excess capacity. Under a system of pegged exchange rates, the values of imports and exports are then exactly proportional to their physical volumes. It then follows that foreign trade has no effect on the level of national income as long as the balance of trade is zero. But when exchange rates, and hence the terms of trade, between two countries are flexible, this is no longer true. If the values of exports and imports are forced into equality while their exchange ratio is altered, their physical volumes cannot have changed in the same proportion. A movement of the exchange rate, therefore, exerts a direct influence on the size of the real national product, quite apart from the effect of changes in the terms of trade on domestic expenditure which we discussed above.

It will now be shown that the direct foreign trade effect of appreciation of a country's currency as the demand for its exports increase must be depressive as long as domestic

prices of each country's own output remain constant.

For simplicity let us suppose that each country exports only one homogeneous commodity. Also for convenience let the commodity unit be chosen so that the domestic price of each country's exports becomes unity. Under these assumptions, the domestic price of imports equals the value of the exchange rate, r, and the revenue from exports in terms of home currency is equal to their physical volume. This is expressed by the condition

$$X = M \cdot r \qquad (9)$$

where

X = physical quantity of exports

M = physical quantity of imports

r = exchange rate, expressed as units of domestic currency per unit of foreign currency.

An increase in foreign demand for the country's exports will cause appreciation of its currency (a fall of r). What happens now as the currency appreciates while the values of imports and exports remain in balance?

The effect on real national income will depend on the changes in the physical volume of exports and imports. Differentiating M and X with respect to r, (from condition 9), we obtain

$$\frac{dM}{dr} = -\frac{\varepsilon \cdot M}{r} \qquad (10)$$

and $\frac{dX}{dr} = - M + \frac{dM}{dr} \cdot r = M(1-\mathcal{E})$

where $\mathcal{E}$ = absolute value of the domestic elasticity of demand for imports (total elasticity).

We now define a ratio $\frac{dx/dr}{dM/dr} = r(1-\frac{1}{\mathcal{E}})$[4] (12)

If we redefine the unit of foreign currency (and so the physical unit of imports) so as to make r = 1 in the initial equilibrium, the price per unit both of exports and of imports in terms of home currency equals 1, and changes in the volumes of exports and imports by the same absolute amount have effects of equal magnitude, but of opposite sign, on real national product and employment. The ratio (12) is simplified to $R = 1-\frac{1}{\mathcal{E}}$ (13)

In the absence of Giffen's case, the denominator of (12) is always negative. A positive value for R therefore, indicates that the volume of exports will rise after an increase in foreign demand. If is seen that the export volume can never rise by more than that of imports. The most favorable case occurs when the domestic elasticity of import demand is infinite. Not only the foreign-trade effect, but also the real-income effect on internal consumption is then

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4 $$\frac{\frac{dX}{dr}}{\frac{dM}{dr}} = \frac{M(1-\mathcal{E})}{\frac{\mathcal{E} \cdot M}{r}} = - \frac{r(1-\mathcal{E})}{\mathcal{E}} = - r\ (\frac{1}{\mathcal{E}} - 1) = r\ (1 - \frac{1}{\mathcal{E}})$$

absent, since all domestic prices remain unchanged. An increase in foreign demand for exports may even lower the physical volume of exports. This occurs whenever the demand elasticity for imports is less than unity and so R assumes negative values. Generally the consequences of increased demand for exports depend on the demand elasticity of imports as follows.

a) Exports rise by the same amount as imports when $\mathcal{E} = \infty$ (R = 1)

b) Exports rise by less than imports when $1 < \mathcal{E} < \infty$ $(0 < R < 1)$

c) Exports remain constant while imports rise when $\mathcal{E} = 1$ (R = 0)

d) Exports fall while imports rise when $\mathcal{E} < 1$ $(R < 0)$

e) Exports fall in proportion to the appreciation of the currency while imports remain unchanged when $\mathcal{E} = 0$.

The real income effect induced by the terms-of-trade change and the direct foreign-trade effect on the national income work against each other. The depressive foreign-trade effect will dominate as long as the domestic elasticity of demand for imports is less than infinite. This is also the result at which Laursen and Metzler arrived.[5]

We will examine now three borderline cases.

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[5]S. Laursen and L. Metzler, op. cit., p. 299.

That is where $\varepsilon = 0$

$\varepsilon = 1$

and $\varepsilon = \infty$

Case where $\varepsilon = 0$

The volume of imports does not change, while that of exports falls in proportion to the appreciation of the exchange rate. The adverse effect of the fall in exports could be counterbalanced only by an equal or greater increase in real domestic absorption. Expenditure on imports has fallen in proportion to the appreciation or, alternatively, by the same amount by which the physical volume of exports has fallen. To compensate for the fall in real national income owing to the lower export volume (always assuming unchanged prices of domestic production), expenditure on domestic output would have to rise by the same amount by which expenditure on imports has fallen. Condition (5) $(\frac{\partial C}{\partial p} > 0)$ tells us, however, that appreciation and the consequent fall in the domestic price level reduces aggregate money expenditure on consumption. A compensating variation of sufficient magnitude in the consumption of domestic output is therefore precluded, and the over-all effect of the rise in foreign demand must be depressive.

Case where $\varepsilon = 1$

Real national product cannot be affected by exports, since their physical volume does not change. The currency

appreciates also in this case, and condition (5) again implies that aggregate money expenditure on consumption is reduced. With an import demand elasticity of 1, total expenditure on imports remains constant, and the incidence of the reduction in aggregate consumer spending falls exclusively on domestic output. Under our assumption that prices of domestic products are rigid, real national income must also fall in this case.

Case where $\varepsilon = \infty$

This is the case where the national income is not affected. No direct foreign-trade effect occurs, since exports and imports increase by the same amount; the real income effect on consumption is absent because the exchange rate remains unchanged.

In all but the last one of the three limiting cases, the increase in foreign demand was seen to be followed by a contraction of domestic national income. It follows from continuity considerations that the same must hold for all intermediate values of the demand elasticity for imports. Infinite elasticity of demand for imports is not a realistic possibility and can therefore safely be dismissed. Strictly Keynesian assumption leave us with the result that under flexible exchanges and in the absence of capital transfers a boom in one country will lower national incomes and employment in the rest of the world. Only a modification of the initial assumption can be expected to reverse the outcome.

There is an interesting corollary to this. With pegged exchange rates, the increase in imports induced by an expansion of a country's national income acts as a leakage of effective demand. Under flexible exchanges and forced equality of export and import values, the increased demand for imports during a boom serves as an additional expansion factor. An upward shift of import demand will result in a rise or a fall in the physical volume of imports, depending on whether foreign demand for the country's exports is elastic or inelastic. The physical volume of exports, on the other hand, increases as long as the elasticity of foreign demand is above zero. With elastic (but not perfectly elastic) foreign demand, the rise in the export volume must always exceed that of imports. If follows that the induced increase in import demand will, through its effect on exports, further raise the national income of the expanding economy, under our assumption. E. Sohmen comments that:

> Apart from its theoretical interest, too much should not be made of Laursen-Metzler effect. The most unrealistic assumption that was made is undoubtedly the one postulating instantaneous balancing of the current account at every instant. Even for the very short run, some relief from the depressive effects of appreciation is brought about by the incipient financing which is the normal custom in international business transactions. A positive trade balance during the period immediately following an increase in the demand for a country's export will occur and is likely to outweigh any adverse effects for some time. Over the long run, the outcome depends on the direction taken by autonomous capital movements.[6]

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[6]E. Sohmen, op. cit., p. 99.

But what is the most probable direction of (net) capital movements in this case?

If it is expected that the depreciation of the expanding country's currency is only temporary, speculators will tend to move funds there. This induces an export surplus for the appreciating country, a factor that counteracts the depressive Laursen-Metzler effect (proveded that the monetary impact of the capital transfer is not too important in comparison with the direct income effects as would be expected under a system of flexible exchange.) Expansion in the world at large is the result, as in a system of pegged exchange rates and rigid prices. Assuming that capital movements are unrestricted, can this outcome be expected to be the normal one?

The answer depends on the policies pursued by the countries concerned. If these policies are designed to eliminate any long-term trend in exchange rates, the answer is yes. For while speculators may, in the face of uncertain expectations, show destabilizing inclinations in the short run, appropriate forward operations by the central bank can force them into line and will inflict losses on those who are obstinate enough to refuse. Given an expectation of stability over the long run, non-speculative long-term capital movements will in all probability conform to the same pattern. Profitable investment opportunities become

more abundant in the expanding economy and interest rates are bound to rise. Rational behavior would consequently dictate a flow of both long-term investment capital (direct as well as indirect) and speculative funds toward the country with the depreciated currency. The result is that the qualitative effect of changes in aggregate demand in one country on the national incomes of other countries is the traditionally accepted one also under a flexible exchange-rate system, although part of the shock that would occur under pegged rates is absorbed by the exchange-rate adjustment. But again all this depends on policies that prevent or convincingly appear to prevent an irreversible one-way movement of fluctuating rates. If this does not happen, no definite conclusions are possible.

We proceed now to examine the case in a dynamic sense. That is we will examine the case where instead of a static equilibrium we have a dynamic one.

Static theory does two things. First, it defines the position of rate of output and price at which everyone will be willing to carry on. Secondly, it has something to say as to how these positions are reached. Most likely the process is one of trial and error. A producer tries producing a certain quantity of output. Experience may then suggest that he could make more profit by producing more.

The decision by an individual to increase output

alters the general level of output. If he is a small unit in a large economy this effect may be unimportant. It may, however, set up a cumulative process of expansion. The aggregated effect of a great number of individual decisions result in growth.

We may now ask: is the rate of this type of growth different than the rate of growth required by certain fundamental conditions? If it is, are there forces tending to correct that rate and bring it in line with the growth required by these fundamental conditions? To answer these questions we will make use of Harrod's[7] fundamental equation. This equation has two forms. In one it is a truism, in the other a statement of the rate of growth which will leave the various parties satisfied.

For the truism the equation may be written as

$$GC = s$$

G, which stands for growth, is the increment of total production in any unit period expressed as a fraction of total production. i.e., $G = \frac{\Delta Y}{Y}$

C (capital) is the increase in the volume of goods of all kinds outstanding at the end of the period over that outstanding at beginning of that period divided by the increment of production in that same period. This can be

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[7]R.F. Harrod, Towards a Dynamic Economics (London: Macmillan & Co. Ltd., 1965), p. 77.

expressed as $C = \frac{I}{\Delta Y}$

s is the fraction of income saved. i.e., $s = \frac{S}{Y}$.

It is not necessary for our argument to assume that s is constant as G changes. All that is required is that any changes in s should be small by comparison to changes in G.

The truism of this equation follows from the definition of the terms. It can easily be seen, by the cancellation of common terms, that it is reducible to the truism that ex-post investment is equal to ex-post saving. If Y stands for income, I for investment and S for saving

$$GC = \frac{\Delta Y}{Y} \cdot \frac{I}{\Delta Y} = \frac{S}{Y} \quad \text{that is } I = S$$

The equation is a dynamic one since it contains G, which refers to a rate of increase.

We now come to the form of the equation which expresses the equilibrium of steady advance. This can be written as

$$G_w C_r = s.$$

G_w being the waranted rate of growth. This equation expresses the condition in which producers will be content with what they are doing.

Comparing this equilibrium of a steady advance with a static equilibrium, we see that in the static equilibrium producers remain satisfied with their existent <u>rate of output</u>.

This need not preclude variations in particular commodities. Some producers may find that the demand for their product is falling off and others that it is increasing; therefore they are not content to rest in their present condition, but are subject to forces requiring them to adjust production upwards or downwards. But if the conditions as a whole are stationary, the amount of contraction of markets for various specialities should be equal to the amount of expansion of markets for other products. An adjustment is made, and the static equilibrium equations prescribe the new values at which the various kinds of output will eventually settle down after a shorter or longer period.

The same circumstances apply to a steady advance. Again this concept need not preclude the more rapid advance in certain sectors, lower advances or even declines in others. In this case, however, there will be an overall tendency to advance somewhat and if the short period conditions are correct for a steady advance, at the rate G_w. G_w can, therefore, be defined as that overall rate of growth which, if executed, will leave enterpreneurs in a state of mind in which they are prepared to continue on a similar advance. Some may be dissatisfied and have to adjust production upwards or downwards, but these adjustments should balance out and, in the aggregate, progress in the current period should be equal to progress in the last preceding period.

The equation $G_wC_r = s$ defines the rate of advance which will give satisfaction and lead to its own perpetuation.

C_r expresses the capital requirements. While in the truistic equation there was an ex-post term expressing the amount of capital goods actually produced per period, C_r is an equilibrium term expressing requirements for new capital. C_r is defined as the requirement for new capital divided by the increment of output which the new capital is required to sustain.

This definition is based on the idea that existing output can be sustained by existing capital and that additional capital is only needed to sustain additional output. That is we assume here that the capital/output ratio is constant and this in turn follows from assuming (1) that inventions are neutral and (2) that the rate of interest is constant.

This does not imply that all inventions are neutral. An invention may be labor saving. In other cases the invention may take the form of an improvement in managerial methods and be, therefore, capital saving. What is postulated here is that on the average the various inventions accruing in a unit period are neutral. On this assumption the existing capital of the country can sustain the existing output.

What about saving? New inventions require new installation and new savings are needed to finance them. In general this need not be the case. Provided that the rate of

change is recognized by enterpreneurs, they will fix their depreciation allowances accordingly. These allowances are likely to be higher in a progressive than in a stagnant economy.

Looking now at the two equations set out we can see that there exists a simple relation between them. From the truistic relation GC = s we see that the greater the G, the lower the C (s being a constant ex-post magnitude.)

In the second relation $G_w C_r = s$, according to what we said above s is also constant and equal to s of the first equation. Therefore if G has a value above G_w, C will have a value below C_r. If $C < C_r$, this means that on balance producers find that the equipment are insufficient to sustain existing output and orders will be increased. And conversely.

This demonstrates the instability of an advancing system. G is a quantity determined from time to time by the collective trials and errors of a large number of people. Only by luck their collective appraisals caused them to hit upon the value G_w. But if they don't do so their experience will tend to drive them farther and farther from it. The only way in which this conclusion could be upset would be by the suggestion that variations in G would cause equally large variations in the value of s. But this possibility has already been excluded.

So far then we have two propositions. (i) There is

a line of advance which, if adhered to, would leave producers content with what they had done. (ii) If the aggregate result of trial and error by numerous producers gives a value for G different than that of G_w, there will be a tendency to adapt production still further away from G_w, whether on the higher or the lower side.

The analysis so far has excluded considerations of technical change and growth in the labor force. It is important, however, to set up additional conditions in order to take into account variations in technology and the labor force. It is also desirable to relate the two equations to that steady rate of advance determined by these conditions. We may set this rate of advance in the form of an equation as follows.

$$G_n C_r = \text{or} \neq s$$

G_n stands for the natural rate of growth and is that rate of growth which, when full employment is maintained, is allowed by the growth in the labor force and the rate of technical change. G_n, therefore, sets a limit to the maximum average value of G over a long period. That is G_n is the ceiling rate of growth the economy can attain over this long period. This follows from the fact that real output could not grow any faster than the rate of growth of the factors of production and the efficiency with which they are used.

After a recession G may attain a higher value than G_n for a considerable period. But it is not possible to maintain growth at a greater rate for an indefinite period than the increase of population and technology allows.

The relation of G_n to G_w is of crucial importance in determining whether the economy over a number of years is likely to be booming or depressed. Whenever G exceeds G_w there will be a tendency for a boom to develop; and vice versa. Now if $G_n > G_w$ there is no reason why G should not exceed G_w for most of the time in which case there will be a tendency for a boom. But if $G_w > G_n$, then G must lie below G_w for most of the time, since, as we said, the average value of G over a period cannot exceed that of G_n. Therefore in such circumstances we must expect the economy to be depressed. The reason is chronic oversaving and overinvestment. Suppose the economy assumes a growth path initially dictated by G_w, where G_w exceeds G_n and unemployment exists. As new capital capacity is added the unemployed labor force and the additions to the labor force resulting from its natural increase are absorbed by the growth in output. But, if G_w continues to exceed G_n, there will come a point where further additions to productive capacity will remain idle because of the lack of sufficient labor. Labor will become more expensive in relation to the proceeds of investment, the marginal efficiency of capital will fall, and the rate of investment will decline, bringing down with it the economy as a whole.

When $G_n > G_w$ the opposite will happen. When growth in capacity is not impaired by a lack of labor, growth can continue in a way which prevents businessmen from being disappointed in the results of their investment activities. With labor abundant and cheap, the tendency is to use their existing capital stock intensively. Profits tend to increase and businessmen are happy: so much so that they may press the actual rate of growth G beyond the warranted rate G_w and produce, possibly, inflation. In this case, we may have the curious situation of inflation in the midst of unemployment, a situation that has characterized certain of the rapidly growing underdeveloped countries.

When $G_n > G_w$, a resulting inflationary trend can be treated by raising G_w. For this purpose saving is a positive virtue, because an increase in saving can raise G_w. On the other hand, a chronic condition of $G_w > G_n$ requires a reduction in the rate of saving.

The relation of the labor force to income and capital growth requirements, emphasised by Harrod, as a source of secular maladies has been disputed by Daniel Hamberg.[8] Hamberg considers the important role played by autonomous investment in setting the value of G_n. G_n, as we saw, is a full-employment growth rate, set by population growth and by the rate of technological advance. It is a rate of growth

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[8]D. Hamberg, Economic Growth and Instability (New York: W.W. Norton & Co., 1956), pp. 101-4.

whose capital requirements are those needed to provide the growing labor force with necessary capital requirement and to implement improvement in technology and therefore are not based upon mere income growth. In this case the situation $G_w > G_n$ means that the capacity growth is too great relative to innovational or autonomous investment requirements. But then, the surplus capacity that occurs when $G_w > G_n$ may be attributed to deficiency in the growth of aggregate demand, to the inadequacy of autonomous investment growth, not to labor shortages. A persistence of this situation over long periods implies that the economy's long-term capital requirements are inadequate relative to its long-term saving propensities. A lowering of s (and G_w), or an increase in the outlets for autonomous investment (and G_n) will close the gap between the two growth rates and remove it as a cause of secular stagnation.

The case where $G_n > G_w$ occurs when the rate of saving is too small relative to the capital requirements of a growing labor force and technology. The situation results from a rate of autonomous investment that persistently pushes ahead of aggregate, full-capacity saving, a situation which forces demand to be in excess of the ability of the economy to supply the demand. The appropriate remedy for this is a rise in s (and G_w) or the advance of technical change or measures to reduce the growth in the labor force.

Let us consider now the case where a country is having trading relations with a wider economy. In this case the fundamental equation can be written in the form

$$GC = s-b,$$

where b is the balance of trade expressed as a fraction of income.

We may further write

$$G_wC_r = s-b$$

For a country in which G_w is tending to exceed G_n and there is, therefore, a tendency towards depression, a positive value of b may be beneficial. This tends to reduce the value of G_w and might bring it into better relation to G_n. A country where saving is high in relation to her potentiality for further growth will be helped by opportunity for investment abroad.

Next let us set out formulae for the growth of exports. Let $_eG$ be the rate of growth of exports and E the value of exports; let $_hG$ stand for the rate of growth of output for the home market and H for the value of that output. Let $_hG_w$ stand for the warranted rate of growth of output for the home market. Then

$$\frac{_eGE \cdot {_hGH}}{E+H} \cdot C = GC = s,$$

$$\frac{_eGE \cdot {_hG_wH}}{E+H} = C_r = G_wC_r = s.$$

From these relations we see that, if the rate of growth of exports exceeds the rate of growth of production for the home market, then the rate of growth of exports will exceed the total rate of growth. If the rate of growth of exports exceeds the warranted rate of growth for the home market, then the rate of growth of exports will exceed the total warranted growth, and the warranted rate of growth of production for the home market will be less than the total warranted rate of growth. Under these conditions, with the propensity to import constant, b will grow through time. This will tend to reduce the warranted total rate of growth, and thus, if initially the warranted total rate of growth is above the natural rate of growth, will tend to bring the former into line with the latter.

The situation where $G_n > G_w$ is one characterized by a relative abundance of labor, a high level of autonomous investment, and an insufficient level of aggregate saving in every period. The relative abundance of labor combined with the high level of autonomous investment demand should operate to lower the price of labor relative to that of capital equipment. This will encourage substitution of labor for capital at given levels of output. In other words, the existing capital stock will be used more intensively. Productivity of capital will increase increasing profits.

As we noted before, businessmen will be satisfied

enough to press the actual rate of growth beyond the warranted rate and produce inflation. In this case a fixed exchange rate system will result in a decrease in the rate of exports, assuming that the foreign demand for a country's exports is elastic. A decrease in b will help increase G_w and bring it into line with G_n. Under flexible exchange rates, on the other hand, inflation will cause a depreciation of the country's currency thus keeping b high and G_w low. It seems therefore that a system of fixed exchanges will be more beneficial.

In the case where $G_w > G_n$, according to our analysis, the economy is expected to be depressed. This will cause a fall in wages and prices. Exports will be stimulated and this increase in b will cause G_w to fall thus closing the gap between it and G_n. In this case it is a matter of indifference as to which exchange rate system the country will choose to be in.

The gap between G_w and G_n when $G_w > G_n$ can be reduced not only by lowering G_w but also by raising G_n. In this respect a revival of international movement of capital may assist the natural rate of growth. It is assumed here that the international movement of capital will be accompanied by an international movement of "know how" which will improve the receiving country's technology and thus raise G_n.

One may now ask: which system of exchange rates is most likely to bring about this desirable state of affairs? The answer is that no matter which system a country adopts, the system alone cannot be expected to cause the necessary capital inflow. The reason is that there are other factors equally important that can limit this inflow. Insecurity of foreign investment, for example, caused by the risk of default or of expropriation, could severely decrease the inflow of capital. The establishment, therefore, of a favorable political and legal climate for foreign investors remains as indispensable condition for a large capital inflow. We may note, however, that a pegged exchange that overvalues a country's currency is enough to inhibit an inflow of private development capital even if no other obstacles stand in its way. Speculative and many forms of long-term capital movements will only be attracted to a country whose currency is expected not to depreciate in the future. If a currency is held at a peg much out of line with its true equilibrium value, and if the country's authorities are unable or unwilling to adopt the deflationary measures that could make it the equalibrium rate of exchange, devaluation can only be postponed but not avoided. The acquisition of claims denominated in the currency of such a country does not only involve an exchange risk, as it would with flexible exchanges, but an exchange loss known with certainty in advance. The

loss could be avoided only if the government guaranteed the reconversion of any capital inflow into the foreigner's currency at the exchange rate at which it came in. Foreign exchange difficulties as a result of currency overvaluation would, however, create fears that controls on the repatriation of funds may be imposed. The defense of pegged exchange rates on the grounds that only they can assure a substantial volume of international capital flows is therefore wrong unless universal faith in the continuity of exchange pegs is maintained. The notion that flexible rates restrain long-term capital movements is disproved by the fact that Canada was one of the world's leading recipients of foreign investment in the 1950's.[9]

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[9]"The International Flow of Private Capital," 1956-1958, International Financial Statistics, (United Nations), p. 79.

CHAPTER VII

SUMMARY AND CONCLUSIONS: THE CASE FOR FLEXIBLE EXCHANGE RATES

The case for flexible exchange rates, however put, rests upon a second-best situation. If all domestic prices and wages were perfectly flexible and adjusted to maintain a fully employed economy, then domestic economies could adapt to any arbitrary pattern of fixed exchange rates. With broad inflexibilities in domestic prices, however, this indifference disappears. To put the argument another way, given whatever constraints or rigidities exist in the domestic economy, a flexible exchange rate would still be a matter of indifference if domestic policy instruments were ample in quantity and quality to keep the foreign exchange market in balance and also achieve all other publicly defined economic goals. But when the available policy tools are too few, too slow, or too weak to gain all desired objectives, the argument grows strong for employing a flexible exchange rate to free these instruments from direct concern with the balance of payments.

The literature opposing flexible exchange rates has put forth several arguments two of which are of

comparable generality. One has turned on the conditions for stability in the foreign exchange market. The "elasticities" approach to the stability of the balance of trade seemed to raise a serious possibility of instability, implying that a flexible exchange rate might run off to zero or infinity in response to small disturbances in international transactions. Against the possible instability Sohmen[1] noted that a foreign exchange market which appears in unstable equilibrium at one exchange rate will find itself in stable equilibrium at other rates, so that the instability is only a local one. Elasticity pessimists, however, can still argue that equilibration by a flexible exchange rate may follow a painful and costly path of adjustment before reaching a new stable equilibrium.

The other general argument against flexible exchange rates is that it adds to the risks and uncertainties of foreign trade. The exporter's costs are incurred in domestic currency. If he contracts for a selling price in foreign currency, say dollars, he does not know what will the dollar price of the domestic currency be when he brings home the foreign-exchange proceeds of his exports. If he fixes his selling price in domestic currency, then the risk is merely shifted on to the shoulders of the foreign importer.

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[1]E. Sohmen, op. cit., p. 3-11.

This argument ignores the risk to trade which are removed by the adoption of a fluctuating exchange rates system. J.E. Meade comments that

> "In this evil world risks in foreign trade cannot be eliminated. Their burden can, however, be diminished. The use of a system of freely fluctuating exchange rates spread the necessary adjustments all round at the margin of all exports and all imports with all countries, whereas the use of large and sudden variations in the quotas for particular products from particular countries concentrates the whole adjustment on one set of people - the choice of victims being, however, unsettled until the bureaucrats make their final decisions."[2]

Risks that cannot be eliminated, on the other hand, could be borne by specialized institutions. A market in forward exchanges enables the United Kingdom exporter to the United States, for example, to get rid of his exchange risk by selling forward the dollars which he expects to get from his exports. The risk is then borne directly or indirectly by some professional foreign-exchange dealer.[3] The opponents to the system maintain that the cost of hedging, where it is possible at all, or the disutility of uncertain future proceeds from international transactions may reduce their volume and impose welfare costs exceeding any gains won through flexible exchange rates. The theoretical answer to this argument, as Friedman[4] pointed out, is that

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[2] J.E. Meade, "The Case for Variable Exchange Rates," Three Banks Review (September, 1955), pp. 16-17.

[3] Ibid., p. 17.

[4] M. Friedman, op. cit., pp. 157-203.

variations in a flexible rate simply respond to disturbances in the underlying national economies. Adjustment to these disturbances must come somehow, if not through exchange rate movements, then through changes in domestic prices or incomes or government controls used to suppress disequilibria. A fluctuating exchange rate simply relieves some domestic policy or market variables of part of the task of adjusting to disturbances. This interpretation can be applied even to long-term capital movements which are often considered as the main potential victim of flexible exchange rates. Flexible rates impose a "conversion risk" of unanticipated gains or losses in repatriating the interest or principal of a long-term loan. But the alternative to a fluctuating rate is domestic adjustments in response to disturbances which (adjustments) increase what is called the "solvency risk" of long-term investments. Unexpected changes in rents, for example, may not only threaten the profitability of the long-term investment actually made but also, more broadly, its status as the most profitable use of funds known to the lender at the time of his original commitment. In this case, there is no *a priori* reason to think that the lenders would prefer solvency risks from conversion risks.

Thus the objection to flexible rates on the basis of uncertainty lacks generality in the same sense as that based upon instability. One can imagine conditions in which either problem would amount to a critical objection

to permitting the exchange rate to fluctuate freely. But neither refutes the general case for flexible rates. The same could be said of many other objections which have been raised. For instance, the discussion of the power of speculation in the foreign exchange market to destabilize the exchange rate seems to have reached agnostic conclusions. Competitive speculation has been shown to stabilize the foreign exchange market when the speculators themselves have certain knowledge about future conditions. But speculation may not always have this sort of useful effect. In order that it should do so, it must be both competitive and well informed. In a really free market there would presumably be a sufficient number of independent alert persons in London, New York and elsewhere for there always to be a pretty competitive market for sterling or dollars in terms of other currencies. But speculation of this kind will be useful only in so far as it is well-informed. It is only in so far as the speculation comes in to support a currency when it is in fact undervalued relatively to its real future prospects that the movement of funds will be on the right scale and in the right direction. The question is will private speculators be well-informed about the probable future movements underlying a country's balance of payments? Professional speculators will probably be able to judge as well as anyone what are likely to be the future changes in the real factors like industrial productivity and commercial opportunity which affect a

country's balance of payments and so the value of its currency. In so far as they are speculating about the future course of such real underlying technological and commercial factors their speculation will often be of that well informed character which will help to reduce the short-run difficulties of long-term adjustments.

But if they cannot rely upon reasonable stability in the general level of domestic prices and costs, then they will have to speculate not only on the future of the underlying real factors, but also upon the future of domestic financial policies. They may decide to sell rather than to buy a currency which, at currency which, at current prices and costs, is already more than sufficiently depreciated to put a balance of payments back into equilibrium, for the reason that they fear a further inflation of prices and costs in that country. If they prove wrong in their fears, then their speculation will merely have caused a further unnecessary downward fluctuation in the currency with all the drawbacks and none of the advantages of such a fluctuation.

The danger could be worse than that. It is possible that this speculation against the currency may itself give rise to the very evils whose expectation has motivated the speculation in the first place. Suppose, for example, that there is some basic adverse movement against a country's external position; its currency depreciates

to a point which is already more than sufficient, in the absence of domestic inflation, to restore it in the long run to external balance; this depreciation is not itself sufficient to touch off any serious spiral of domestic inflation; but speculators fear some substantial domestic inflation, and therefore continue to sell rather than to buy the currency; and this further depreciation is sufficient to start off a serious round of domestic inflation, so that the speculators fears are, after all, justified.[5]

The complexity of the problem of predicting the effect of speculation makes necessary an appeal to the factual record. A recent evidence is Paul Wonnacott's study of Canada's experience with a flexible exchange rate,[6] which seems to show that short-term capital movements tended to stabilize movement of the Canadian exchange rate more often than not. But a recent reappraisal of the interwar period[7] seems to show that under seriously disturbed

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[5]Inflation can come about in this manner. When a country's exchange rate depreciates it raises the price of imports and so the cost of living; money wage rates rise in consequence; the maintenance of full employment then involves a domestic financial policy which allows the general level of money incomes and prices to rise parallel to the wage rate; this puts a further strain on the balance of payments, which necessitates a further depreciation; and this in turn starts another round of the same process.

[6]P. Wonnacott, The Canadian Dollar, 1948-1958 (Toronto, 1960), pp. 124-28. Also T.L. Powrie, op. cit., pp. 76-89.

[7]R.Z. Aliber, Speculation in the Foreign Exchanges: The European Experience, 1919-1926 (Yale Econ. Essays, 1962), pp. 171-245.

economic conditions and considerable uncertainty about equilibrium currency values, speculation works much less well.

The appraisal of flexible exchange rates, then, seems to run in terms of particular cases. Arguments against them could prevail, for example, for particular countries.

The relative strength of the case for flexible exchange rates may differ between countries for two reasons. First, the typical form and source of disturbances to the balance of payments differs significantly from country to country, and a flexible rate does not help equally to restore internal and external equilibrium in all cases. Second, the adequacy and flexibility of internal policy instruments and the restrictions on their use imposed by market forces may vary among countries and the patterns may not mesh with equal smoothness with flexible rates.

A country has the strongest case for flexible rates when disturbances to its balance of payments typically come from outside its borders. A shift in demand toward a country's exports under fixed rates initially falls entirely on the export industries. The internal adjustment of the national income and the general price level necessary to restore equilibrium comes only after and on account of the export expansion. A fluctuating exchange rate, by contrast, tends to adjust without an expenditure lag, cushioning the impact on the output of exports and furnishing an immediate

incentive for output adjustments in the proper direction elsewhere in the economy. If resource reallocation has its costs, if large changes for a particular industry are much more costly than small ones, and if transitional changes for a particular industry cause long-lasting misallocations of fixed capital, there is a strong case for adjustment to external demand shifts through flexible rates.

Likewise, it seems that a country can generally insulate itself from income fluctuations abroad much better through flexible than through fixed exchange rates.

When disturbances to the balance of payments originate within the domestic economy, however, the case for a flexible exchange rate may become less strong. If the country suffers from endogenous business fluctuations which it cannot for political reasons fully control by internal policy, adopting a flexible exchange rate denies it the assistance of an income leakage through the balance of trade at the top of the cycle and an income injection at the bottom, which fixed rates would tend to promote. The same sort of conclusion might follow for some other sorts of domestic disturbance to the balance of payments. Consider a country exporting primary products, which faces an elastic export demand but undergoes large random variations in export supply, such as through crop failures. Under fluctuating rates, the home currency would tend to appreciate in good crop years, lowering the price of imports

and causing fluctuations to the output of the import - competing industries inverse to those in the export sector. This would not be desirable, especially since by maintaining fixed exchange rates under such conditions and taking fiscal action to offset the effects of income variation a country might insulate itself somewhat from such fluctuations in the export earnings and the income and output redistributions which they imply. A fixed exchange rate could have somewhat the same function as an export stabilization scheme.

Turning from the sources of disturbance to the foreign exchange market, the constraints upon domestic economic policy likewise influence the strength of the case for the adoption of flexible exchange rates by a particular country. In a case of cost-push inflationary pressures, for example, against which internal policy measures are having questionable effectiveness some economists argue that government must stick to a fixed exchange rate. By that they imply that the defence of such a system would discourage interest groups from seeking price increases while renewed wage demands would start after a cost of living changes following a currency devaluation. Viner has declared that for many country avoidance of exchange depreciation "seems to be the only factor of any strength which puts a brake on inflation."[8]

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[8]J. Viner, "Some International Aspects of Economic Stabilization," in L.D. White (ed.), The State of the Social Sciences (Chicago: Chicago University Press, 1956), pp. 28398.

Depreciation under a flexible rate might create inflationary pressure without any symmetrical tendency for appreciation to bring about deflation. In this case, exchange rate fluctuations keyed to the ordinary business cycle would build a ratchet effect into the domestic price level where one would not otherwise exist.

On the other hand, other economists have held that conditions of wage pressure and wages rigid in the downward direction make the strongest case for flexible rates. Disturbances to the balance of payments which cannot be eliminated by internal deflation may be subject to cure by the depreciation of a flexible rate. The assumption in this case is that internal cost pressures are not sensitive to the price of imports, so that real income can be reduced through exchange depreciation where it would be impossible through domestic deflationary pressure without unemployment resulting.[9] These opposing arguments seem to differ on an issue of fact: the sensitivity of the domestic money cost level to the price of imports. The answer may not be the same for every country.

Economists who feel that the present system of fixed exchanges among the major industrial countries is workable

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[9]R.A. Mundell, "A Theory of Optimum Currency Areas," American Economic Review (September, 1961), p. 663.

have held that, with the aid of some international cooperation, external disequilibria can be handled through small changes in countries' relative rates of inflation. The nation in deficit need only restrain increases in its price level, and the nation in surplus may simply pursue its full employment and growth policies with a little more vigor. The suggestion implies that autonomous disturbances can be offset and balance-of-payments equilibrium maintained by these slight policy shifts - all without forcing any country into choosing between a change of its exchange rate and domestic policies. The merit of this case turns upon factual questions. How much effective freedom exists for industrial countries to effect the balance of international payments by adjusting rates of change in their price levels, even through international cooperation? How large are the autonomous swings in the balance of payments which would typically have to be absorbed if this system is to work over a sustained period of time? Assuming that such policy co-ordination secures international equilibrium, do the productivity growth rates of the industrial countries lie close enough together to let this "moving equilibrium" persist? It is not easy to answer questions of this complexity. This complexity, however, may furnish a case for flexible rates.

Another consideration affecting a country's choice of a fixed or flexible exchange rate is whether such a policy can let it make use of international disturbances to help

achieve internal balance. A nation's policy makers may foresee a prolonger structural change in its foreign trade, such as declining demand for a major export product. This forecasts deteriorating terms of trade and tendencies toward either depreciation or balance-of-payments deficits. They may also foresee a chronic problem of internal balance, such as inflationary pressure. R.E. Caves[10] thinks that the best policy in such a situation might be the "adjustable peg" - periodic devaluation when the current account has become significantly unfavorable, with the existing deficit on current account serving as a brake on inflationary pressures. Conversely, a country facing this same deterioration of its terms of trade and a prospect of difficulties in maintaining full employment at home would have a strong case for adopting a fluctuating exchange rate. The flexible rate would not make a positive contribution to using the external disturbance to offset the internal one, except possibly by speeding the process of drawing new industries into the export markets and thus shifting upward the aggregate rate of investment through their expansion. In any case, it would avert the leakage of an unfavorable balance of trade as an additional burden on policies seeking to secure domestic full employment.

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[10]R.E. Caves, "Flexible Exchange Rates," American Economic Review (May, 1963), pp. 120-29.

So far we have assumed that the level of private international capital movements is independent of the changes occuring in the current account. But induced capital movements can have critical results for the effectiveness of domestic policy. In the extreme case, large amounts of perfectly mobile capital will create a link between the interest rates of different countries. A nation raising its interest rates to restrain aggregate demand would witness only a great increase in its capital inflow or decrease in its outflow. Under fixed exchange rates its exchange stabilization authority would accumulate large holdings of foreign currency, or its exchange rate would appreciate under a regime of flexible rates, but domestic investment would not be directly checked. This is again a problem of inadequate policy instruments, in which case the choice of a flexible exchange rate may have some effect of either relieving or augmenting the inadequacy. A nation with an adequately flexible fiscal policy or selective controls on the availability of credit might be indifferent to the constraints of international capital movements on policies operating through the domestic interest rate.

To take an extreme case, suppose that monetary policy operating through the interest rate is the only substantial corrective policy for inflation or unemployment at home and that no domestic market forces act

independently to curb these conditions. With a fixed exchange rate, attempts at changing the interest rate simply swamp the exchange stabilization fund which maintains the fixed rate, either exhausting foreign exchange supplies if the interest rate has been lowered or converting the stabilization reserve to foreign currency if it has been raised. No effective means exists, then, for achieving internal balance. If the exchange rate fluctuates freely, raising the interest rate to combat inflation causes a substantial capital inflow and appreciation of the domestic currency. This change causes the interest rate policy to have some effect, though only indirect, on internal equilibrium, for the appreciation now creates an unfavorable trade balance and effects the real capital transfer. In short, when the interest rate becomes a key domestic policy variable, international capital movements become troublesome under any system of managing international payments. But they weaken the pursuit of domestic equilibrium in the short run more under fixed than under flexible exchange rates. The superiority of flexible rates in this case is further strengthened when we note the probable influence of interest rate changes on forward rates and thus on the profit margin on covered international short-term capital movements.

In the light of this conclusion, one wonders about Canada's troubles with its flexible exchange rate, a disenchantment commonly associated with the domestic

consequences of international capital movements. A view often heard is that the Canadian exchange rate failed because it did not decline sharply from 1958 on, a time when Canada's unemployment rate was disturbingly higher than that of the United States. Assuming that Canada faces interest-elastic international capital markets, Canada should have been able to stem its large inflow of foreign capital by lowering its structure of interest rates. That policy would have reduced the premium on the Canadian dollar and improved the trade balance and, through it, the level of employment. A look at the Canadian policy of that time suggests, however, that the trouble lay with policies aimed not at lowering but at raising the interest rate in the face of unemployment. The differentials of Canadian interest rates over their United States counterparts increased in the late fifties. As one would expect, the capital inflow increased, the Canadian dollar tended to appreciate, and the unemployment problem grew all the worse.

The Canadian flexible exchange rate is abandoned now, victim, as it seems, not of its own malfunctioning but of inappropriate monetary policies.

In summary, this thesis has acknowledged the general theoretical case for flexible exchange rates. There are, after all, only four ways in which the pressures on balances of payments produced by changes in the circumstances affecting international transactions can be met:

(1) by counterbalancing changes in currency reserves;

(2) by adjustments in the general level of internal prices and incomes;

(3) by adjustments in exchange rates, and

(4) by direct controls over transactions involving foreign exchange.

The paucity of existing currency reserves makes the first impractical for all but very minor changes unless some means can be found to increase the currency reserves of the world.

The importance attached to internal stability everywhere makes the second method one that would not be permitted to operate; the institutional rigidities in internal price structures make it undesirable that it should be the major means of adjustment.

The third method has been ruled out in recent years, partly because of a questionable interpretation of limited historical evidence; partly because it was condemned alike by traditionalists, whose ideal was a gold standard that either run itself or was ran by international central bankers but in either case determined internal policy, and by reformers, who distrusted the price system in all its manifestations.

The fourth method of direct controls has thus been left the only way by which pressures on the balance of payments can be met. Yet this method seems to be the least desirable of the four.

There are no major economic difficulties to prevent the establishment by countries of exchange rates freely determined in open markets, primarily by private transactions, and the abandonment of direct controls over exchange transactions. A move in this direction is a prerequisite for the economic integration of the free world through multilateral trade.

APPENDIX A

MATHEMATICAL DERIVATION OF THE MARSHALL-LERNER CONDITION

The Marshall-Lerner condition states that depreciation will improve the balance of payments of a country and appreciation worsen it, if the sum of the elasticities of demand for a country's exports and of its demand for imports is greater than one.

To establish the condition under which a depreciation of the exchange rate will improve a country's balance of trade we will assume here a balance of trade measured in foreign currency. We will also assume that exports and imports each consists of a single homogeneous commodity.

The following notation will be used.

X	= physical quantity of exports
M	= physical quantity of imports
px, pm	= foreign prices of exports and imports, respectively
qx, qm	= domestic prices of exports and imports
r	= exchange rate, expressed as units of domestic currency paid per unit of foreign currency

E_x = (foreign) elasticity of demand for exports

E_m = (domestic) elasticity of demand for imports

By definition, $p_x = \frac{q_x}{r}$ and $q_m = p_m \cdot r$.

The demand for exports is a function of their foreign price, or $X = X\ (p_x) = X\ (\frac{q_x}{r})$. Total revenue from exports (in foreign currency) will then be $X\ (\frac{q_x}{r}) \cdot \frac{q_x}{r}$. Demand for imports is a function of their domestic price, or $M = M\ (q_m) = M\ (p_m \cdot r)$ and total expenditure on imports in terms of foreign currency becomes $M\ (p_m \cdot r) \cdot p_m$

As a consequence, the balance of trade in terms of foreign currency is:

$$B = X\ (\frac{q_x}{r}) \cdot \frac{q_x}{r} - M\ (p_m \cdot r) \cdot p_m \qquad (1)$$

A simplifying assumption is that the supply elasticities in both countries are infinite, so that the domestic prices of each country's exports when expressed in its own currency (q_x and p_m in our notation), are constants. A general formula for the case in which this restriction is removed will be given at the end of this Appendix.

With q_x and p_m assumed constant, the balance of trade becomes a function of the exchange rate alone, and the effect of a change in the exchange rate is found by differentiating B (r) with respect to the exchange rate.

$$\frac{dB}{dr} = \frac{dX}{d(\frac{q_x}{r})} \cdot \left\{-\frac{q_x}{r^2}\right\} \frac{q_x}{r} + X \cdot \left\{-\frac{q_x}{r^2}\right\} - \frac{dM}{d\ (p_m \cdot r)} \cdot p_m^{\ 2} \qquad (2)$$

This can be rewritten:

$$\frac{dB}{dr} = X \cdot \frac{q_x}{r^2} \left\{ \frac{dX}{d(\frac{q_x}{r})} \left[\frac{-\frac{q_x}{r}}{X} \right] - 1 \right\} + \frac{M \cdot p_m}{r} \left\{ - \frac{dM}{d\,(p_m \cdot r)} \frac{p_m \cdot r}{M} \right\}. \qquad (3)$$

In the first bracket, we recognize the foreign demand elasticity for exports, E_x, in the second, the domestic elasticity of import demand, E_m. The minus signs make the expressions for the elasticities positive (in the absence of Giffen's paradox). We can therefore take their absolute values and write

$$\frac{dB}{dr} = X \frac{q_x}{r^2} \left\{ \left| E_x \right| - 1 \right\} + \frac{M \cdot p_m}{r} \left| E_m \right| . \qquad (4)$$

A depreciation is indicated by an increase of r. To improve the balance of trade, it will have to result in a rise of B, the balance of trade. The condition for a successful depreciation is therefore

$$\frac{dB}{dr} > 0,$$

or

$$\frac{M \cdot p_m}{X \cdot \frac{q_x}{r}} \left| E_m \right| + \left| E_x \right| > 1. \qquad (5)$$

$X \cdot \frac{q_x}{r}$ is the value of exports.

$M \cdot P_m$ the value of imports, both expressed in terms of foreign currency. If trade was in balance to begin with, the above condition says that the sum of the demand elasticities has to exceed unity if a small depreciation should be successful. This is the Marshall-Lerner condition in its original form.

If there is an import surplus $(M \cdot P_m \quad X \cdot \frac{q_x}{r})$, a small devaluation will still result in an improvement even if the sum of the demand elasticities falls below unity. The permissible deficiency depends on the size of the trade deficit , as indicated in the condition above.

Relaxing now the assumption that both supply elasticities are infinite, the general condition becomes[1]

$$\left[\frac{M \cdot P_m}{X \cdot \frac{q_x}{r}}\right] \frac{|E_m|\,(1+\eta_m)}{|E_m| + \eta_m} - \frac{\eta_x (1 - |E_x|)}{\eta_x + E_x} > 0 \qquad (6)$$

Where η_x and η_m are the supply elasticities of exports and imports respectively.

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[1]A reference for the derivation of the general condition is Joan Robinson, A.E.A. Readings in the Theory of International Trade (Homewood, Illinois: R.D. Irwin (n.c., 1950), p. 90.

APPENDIX B

EULER'S THEOREM

Euler's theorem is a special relationship obtained from homogeneous functions and is well known to economists in connection with marginal productivity theory, usually under the name of adding up theorem.

Let u = f (x,y) be a homogeneous function of degree h. Then, the following relation holds identically:

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} \equiv hu \qquad (1)$$

This relation is proved by use of implicit differentiation, letting

$$f(tx,\ ty) = t^h f(x,\ y)$$

$$\text{left hand side} = \frac{\partial f(tx,\ ty)}{\partial tx} \cdot \frac{\partial tx}{\partial t} + \frac{\partial f(tx,\ ty)}{\partial ty} \cdot \frac{\partial ty}{\partial t}$$

$$= x^f{}_{tx} + y^f{}_{ty}$$

$$\text{right hand side} = \frac{\partial t^h}{\partial t} f(x,y) + t^h \frac{\partial f(x,y)}{\partial t}$$

$$= ht^{h-1} f(x,y) + 0$$

$$= ht^{h-1} f(x,y)$$

Since l.h.s = r.h.s we have

$$x f_{tx} + y f_{ty} = h t^{h-1} f(x,y)$$

Thus, if t = 1, then, since t can be any number

$$x f_x + y f_y = hf(x,y)$$

h is the degree of the equation. If we have a linear homogeneous function, then h = 1, and

$$x f_x + y f_y = f(x,y)$$

or

$$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = u$$

When we have a second degree equation it will become

$x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y} = 2u$ and similarly for higher degrees.

APPENDIX C

THE STRUCTURE OF RHOMBERG'S MODEL OF CANADA'S FOREIGN EXCHANGE MARKET

The model described in pages 52-57 could be tested by subjecting each equation individually to least-squares multiple regression analysis. However, application of the least-squares technique to a system of simultaneous equations will generally result in biased estimates of the coefficients. To avoid this bias, the coefficient have been computed by the "limited-information" method. Least-squares estimates have also been computed for comparison purposes. The computations were carried out for 24-quarter period 1952-57. The model consists of thirteen equations. All relations are taken to be linear in the original variables. Equations 8 through 13 are identities. For the stochastic equations, 1 through 7, the limited information estimates (L.I.) are given first, the least-squares estimates (L.S.) are given second. The standard errors of the parameter estimates are put in paretheses below the coefficients. The value for d is the Durbin-Watson test statistic for serial correlation (in the case of 24 observations, serial correlation should not be suspected - on the 95 per cent level of confidence - if d exceeds 1.33,

1.43, and 1.54, respectively, in equations containing 1, 2, and 3 predetermined variables). In the least-squares estimates, R^2 is the square of the multiple correlation coefficient.

(1) The Speculative Net Demand for Canadian Dollars

(L.I.) $$S = -\underset{(640)}{2430}\Delta r + \underset{(51)}{340}e - \underset{(61)}{125}h + 76.5$$

$$d = 1.74$$

(L.S.) $$S = -\underset{(1100)}{3910}\Delta r + \underset{(97)}{315}e - \underset{(117)}{110}h + 74.8$$

$$R^2 = 0.64 \qquad d = 1.69$$

S = speculative net demand for (if negative, net supply of) Canadian dollars = value of short-term capital movements (million dollars).
(jointly dependent variable)

Δr = change in the exchange rate from preceding quarter; r = U.S. dollars per Canadian $1.00, quarterly average of daily noon rates.
(jointly dependent variable)

e = indicator of exchange rate expectations = 90-day forward premium on Canadian dollar adjusted for the U.S. - Canadian short-term interest differential
(per cent per quarter)
(predetermined variable)

h = U.S. minus Canadian three month Treasury bill rate
(per cent per quarter)
(predetermined variable)

(2) Canadian Demand for Imports

$$\text{(L.I.)} \quad M = +\underset{(0.019)}{0.199Y'd} - \underset{(510)}{1290}\ (P_m/rP_c) + \underset{(0.043)}{0.594I'} + 1181$$

$$d = 1.89$$

$$\text{(L.S.)} \quad M = +\underset{(0.035)}{0.193Y'd} - \underset{(866)}{615}(P_m/rP_c) + \underset{(0.077)}{0.625I'} + 567$$

$$R^2 = 0.92 \qquad d = 1.97$$

M = real imports of goods and services (million dollars)
(jointly dependent variable)

Y'd = real disposable income less changes in farm inventories
(million dollars)
(jointly dependent variable)

P_m = import price index (1949 = 1)

r = exchange rate = U.S. dollars per Canadian $1.00,
quarter average of daily noon rates)
(jointly dependent variable)

P_c = domestic price index of consumer and investment goods
(1949 = 1)
(predetermined variable)

I' = real gross domestic investment less change in farm
inventories (million dollars)
(predetermined variable)

NOTE: The supply of imports is assumed to be infinitely elastic at the price P_m, which consequently becomes a predetermined variable.

(3) Foreign Demand for Canadian Exports

$$(\text{L.I.}) \quad X^a = +\underset{(220)}{907}\,(p_x r/p_s) + \underset{(1.26)}{7.58}\,Y_f{}^a - 628$$

$$d = 1.25$$

$$(\text{L.S.}) \quad X^a = +\underset{(195)}{610}\,(p_x r/p_s) + \underset{(1.17)}{8.57}\,Y_f{}^a - 375$$

$$R^2 = 0.86 \qquad d = 1.10$$

X^a = real exports of goods and services (seasonally adjusted, million dollars).

(jointly dependent variable)

p_x = Canadian export price index (1949 = 1)

(jointly dependent variable)

p_s = export price index of countries competing with Canada in world markets (1949 = 1)

(predetermined varaible)

$Y_f{}^a$ = index of industrial production of principal customers of Canada, weighted by 1953 share in Canadian exports (1949 = 100)

(predetermined variable)

r = as above

(4) Supply of Canadian Exports

$$(\text{L.I.}) \quad X = +\underset{(1440)}{2510}\,(p_x p_c) + \underset{(0.056)}{0.241}Y - 2414$$

$$d = 2.12$$

$$(\text{L.S.}) \quad X = -\underset{(768)}{66}\,(p_x p_c) + \underset{(0.026)}{0.116}Y + 698$$

$$R^2 = 0.53 \qquad d = 2.19$$

X = real exports of goods and services (not seasonally adjusted, million dollars)

(jointly dependent variable)

Y = Canadian real GNP (million dollars); this variable represents Canada's capacity to produce exports

(jointly dependent variable)

p_x, p_e = as above

(5) Net Long-Term Capital Imports into Canada

$$\text{(L.S.)} \quad L = \underset{(0.064)}{0.276 I_p} + \underset{(0.265)}{0.6480} + \underset{(61.5)}{92.3i} - 220$$

$$R^2 = 0.67 \qquad d = 1.76$$

L = net long-term capital imports into Canada (million dollars)

(jointly dependent variable)

I_p = Canadian domestic investment in nonresidential construction, machinery, and equipment (undeflated, million dollars)

(predetermined variable)

D = net new issues of provincial bonds and debentures (million dollars)

(predetermined variable)

i = excess of Canadian over U.S. long-term interest rate (comparable bonds per cent per annum) (predetermined variable)

NOTE: Equation 5 contains only pretermined variables on the right-hand side and consequently no separate limited-information estimate is given. (The least-squares estimate are identical in this case.)

(6) Relation Between Disposable Income and GNP

(L.I.) $$Yd = + \underset{(0.112)}{0.805}Y - 506$$

$$d = 1.90$$

(L.S.) $$Yd = + \underset{(0.083)}{0.577}Y + 711.$$

$$R^2 = 0.69 \qquad d = 1.90$$

Yd = real disposable income (million dollars) (jointly dependent variable)

Y = as above

(7) Consumption Function

(L.I.) $$C = \underset{(0.067)}{0.926}Y'd + 37.8$$

$$d = 1.91$$

(L.S.) $$C = + \underset{(0.067)}{0.918}Y'd + 68.3$$

$$R^2 = 0.90 \qquad d = 1.89$$

C = real consumption expenditure (million dollars) (jointly dependent variable)

Y'd = as above

Identities

(8) $S = -B$

(9) $B = Xp_x - M(p_m/r) + L + A + Fa$

A = change in official reserves (million dollars)

(predetermined variable)

F_a= balance of migrant's funds and inheritances (which are omitted from X and M; million dollars)

(predetermined variable)

B = Canada's balance of payments "surplus" or "deficit" in Canadian dollars (million dollars)

(jointly dependent variable)

X, p_x, M, p_m, L = as above

(10) $X^a = X/Q_x$

Q_x = seasonal adjustment factor (predetermined variable)

X, X^a = as above

(11) $\Delta r = r-r_{-1}$

r_{-1} = exchange rate during the preceding quarter

(predetermined variable)

Δr, r = as above

(12) $Y = C + I' + H_a + G + X - M$

H_a= change in farm inventories (in real terms, million dollars)

(predetermined variable)

G = real government expenditure on goods and services (million dollars)

(predetermined variable)

Y, C, I', X, M = as above

(13) $Y'd = Y_d - H_a$

$Y'd$, Yd, H_a = as above

The coefficients of the price variables in Equation 3 (L.I.) and (L.S.) and in Equation 4 (L.S.) have the unexpected sign. The other coefficients have the theoretically expected sign.

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